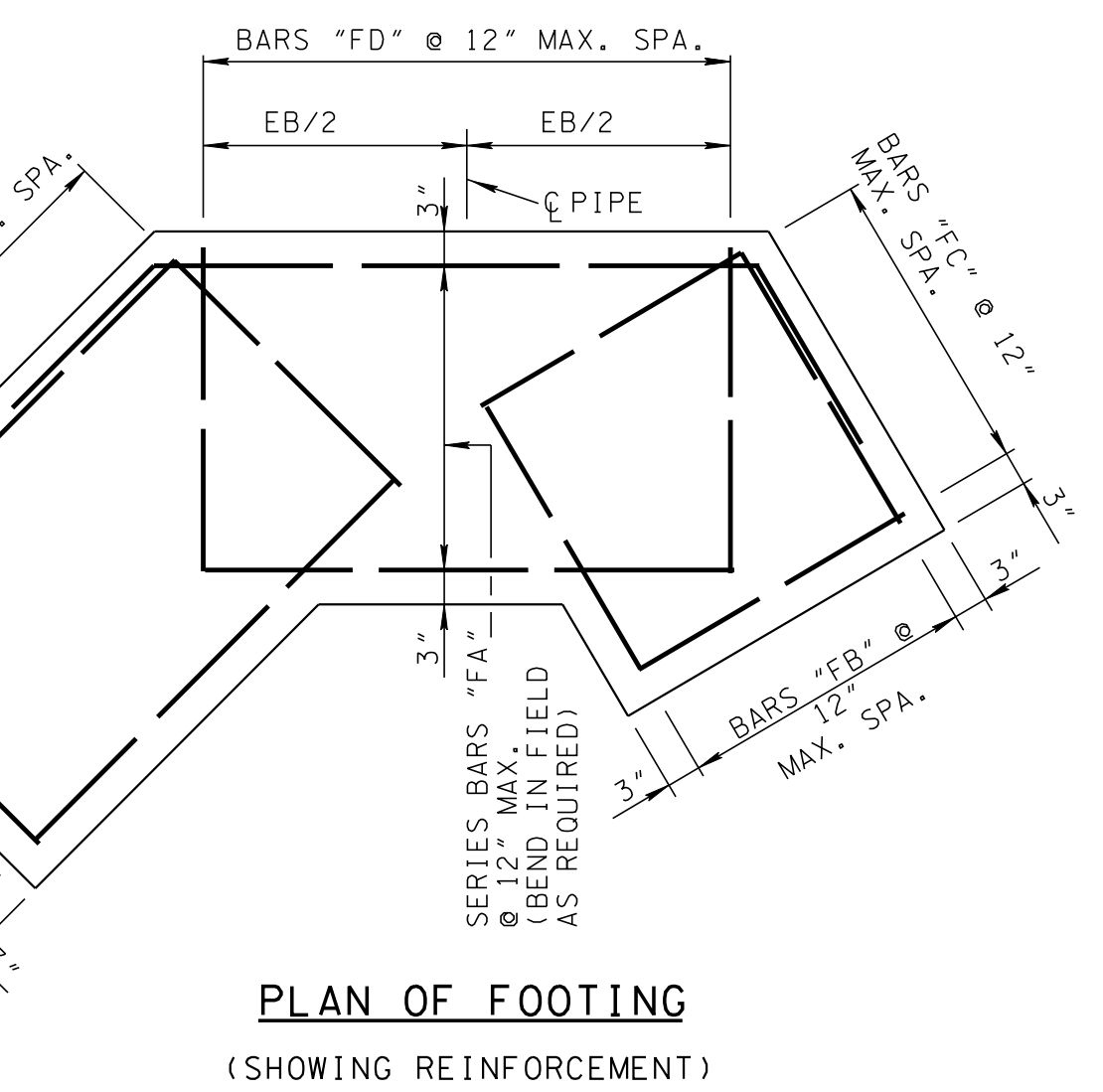
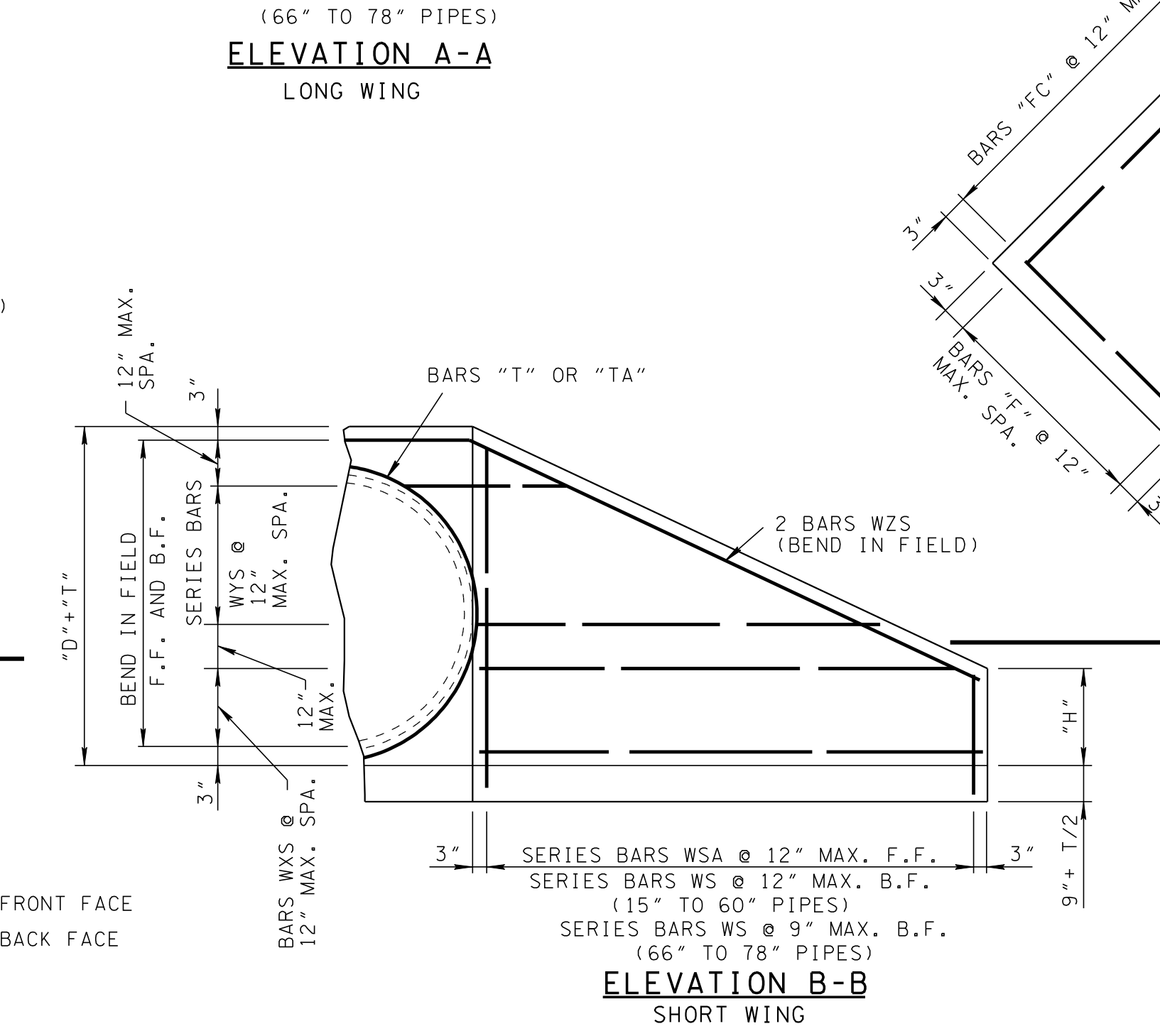
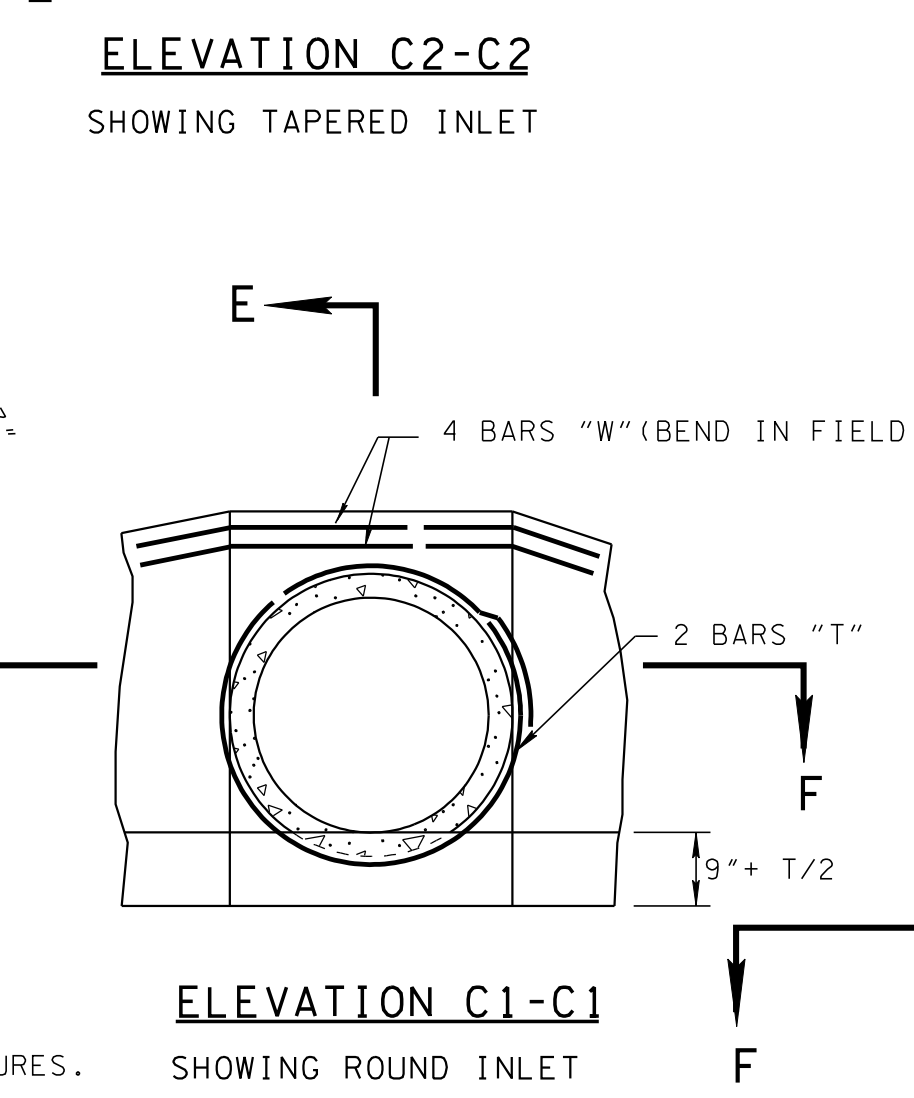
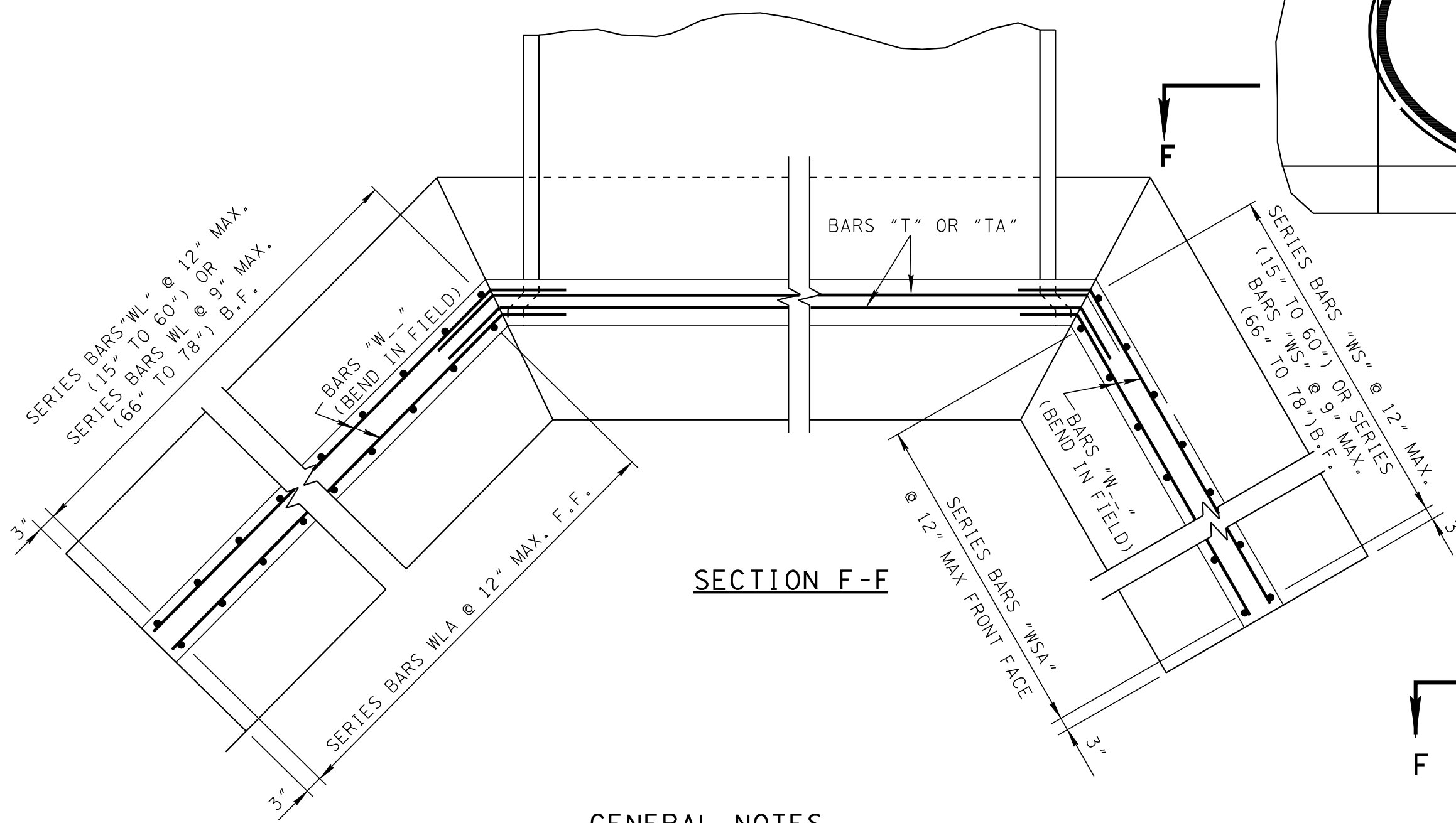
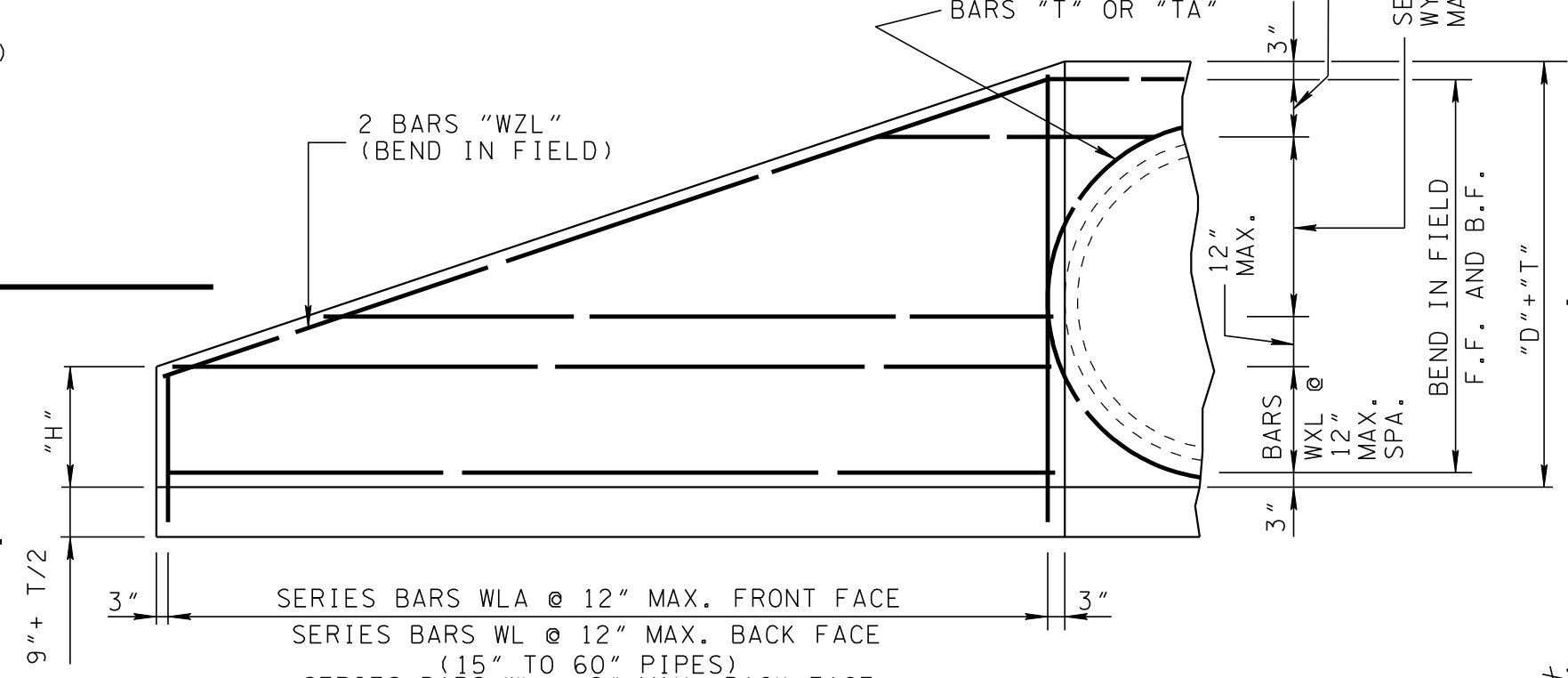
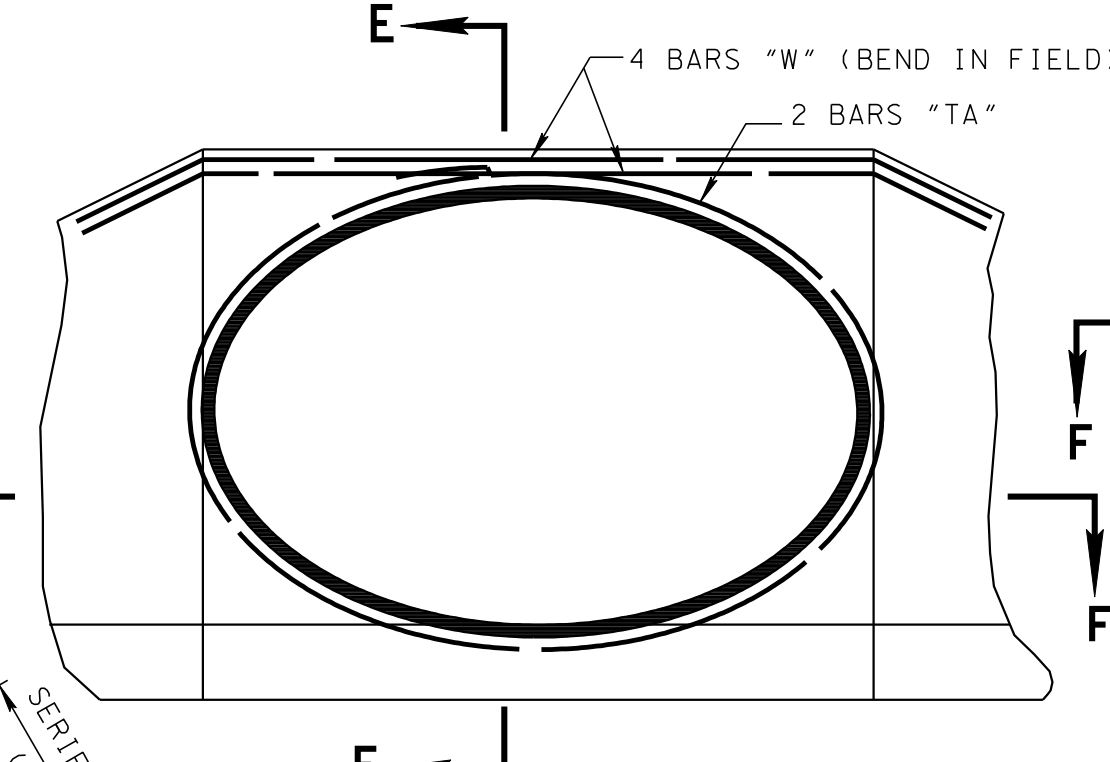
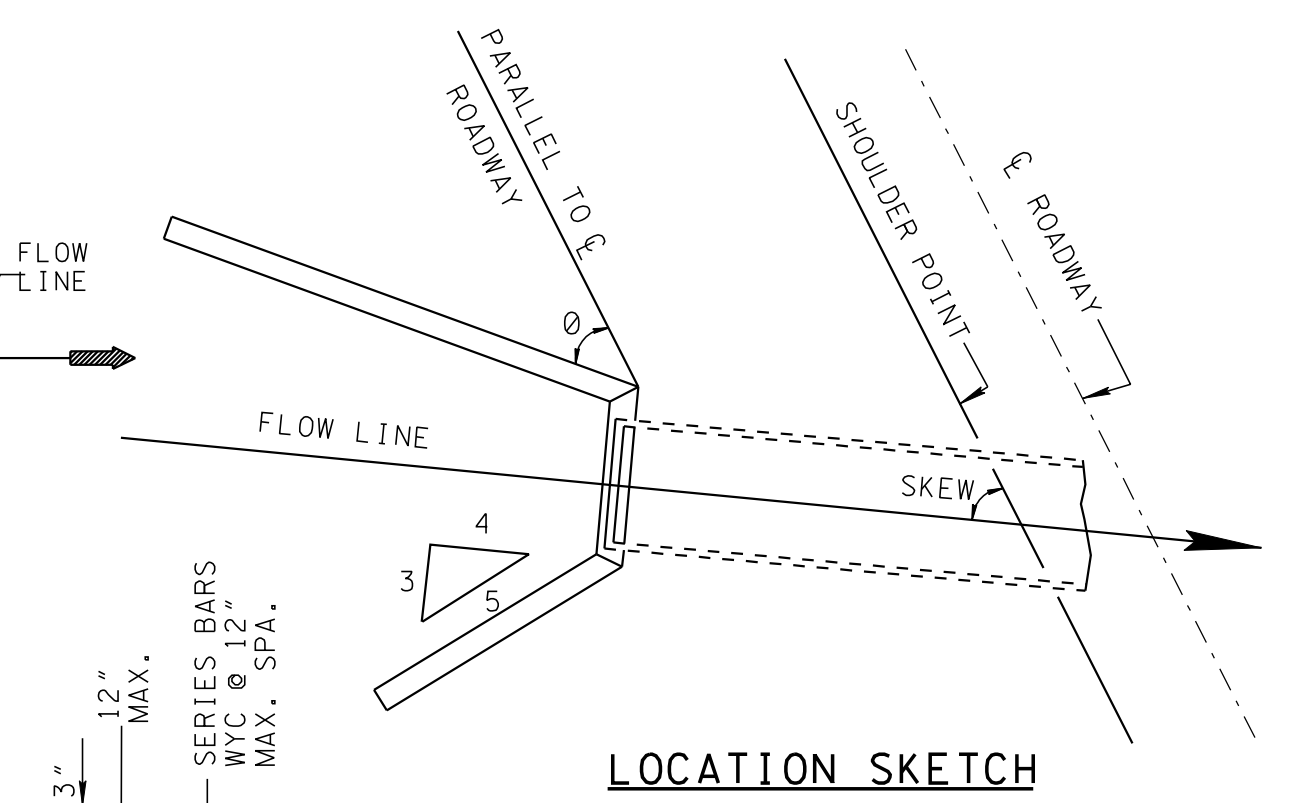


NOTES: "D" = NOMINAL INSIDE PIPE DIAMETER,  
 "D"+"T" = WALL HEIGHT, FOR DIMENSIONS  
 "D" AND "T", SEE DWG. NOS. D-PE-9A AND  
 D-PE-9B.

FOR ALL DIMENSIONS REPRESENTED BY  
 LETTER VALUES, SEE DWG. NOS. D-PE-9A  
 AND D-PE-9B.



**GENERAL NOTES**

SPECIFICATIONS: STANDARD ROAD AND BRIDGE SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION, (CURRENT EDITION)

DESIGN SPECIFICATIONS: AASHTO CURRENT EDITION WITH ADDENDA.

CONCRETE: TO BE CLASS "A".  $f'_c = 3000$  psi. SEE SPECIAL PROVISION REGARDING SECTION 604 - CONCRETE STRUCTURES.

REINFORCING STEEL: TO BE ASTM A615 GRADE 60. STANDARD CRSI HOOK DETAILS APPLY UNLESS OTHERWISE NOTED ON BILL OF STEEL. BENDING DIMENSIONS SHOWN ARE BASED ON GRADE 60. SPACING DIMENSIONS ARE CENTER TO CENTER UNLESS OTHERWISE NOTED ON DETAIL DRAWINGS.

NOTE: F.F. DENOTES FRONT FACE  
 B.F. DENOTES BACK FACE

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

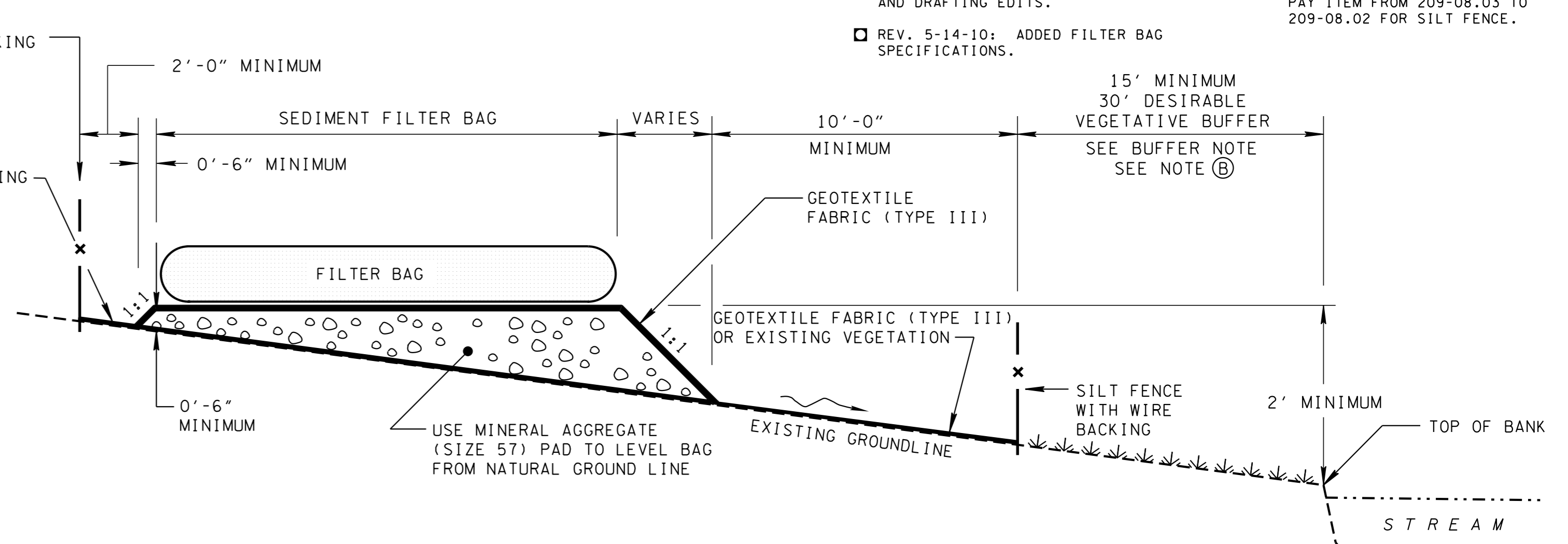
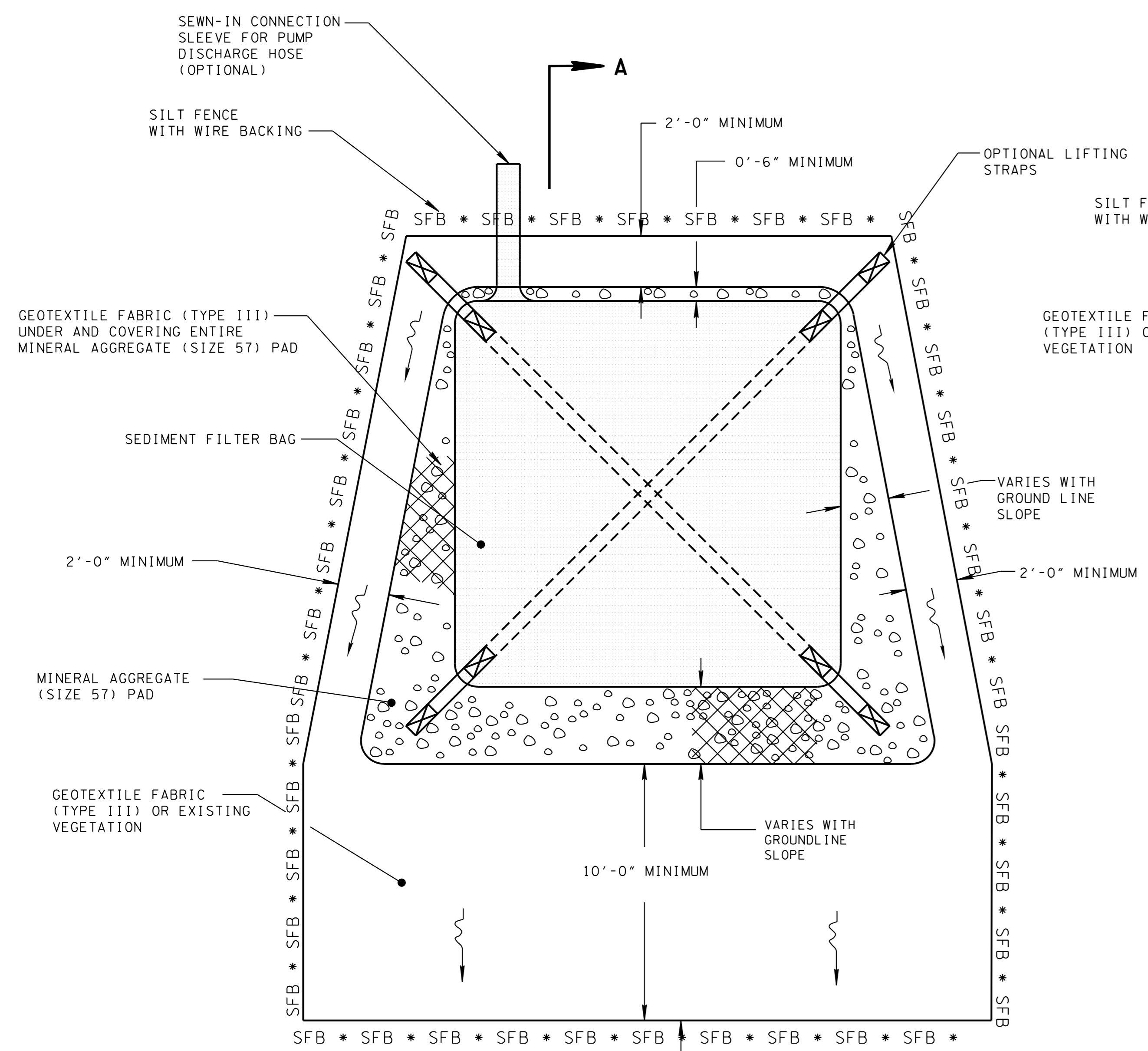
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**CONCRETE ENDWALLS TYPE "B"**  
 (FOR ROUND AND SIDE TAPERED INLETS, PIPE SIZES 15" TO 78", ALL SKEWS, 2:1 AND 4:1 SLOPES)  
 1976

D-PE-9



- REV. 8-1-12: MODIFIED BUFFER DIMENSION, ADDED BUFFER NOTE, MINOR EDITS TO GENERAL NOTES.
- REV. 10-26-03: ADDED EROSION CONTROL SYMBOL.
- REV. 5-27-04: CORRECTED DIMENSION IN SECTION A-A.
- REV. 4-15-06: ADDED CONNECTION SLEEVE AND OPTIONAL LIFTING STRAPS, REFORMATTED SHEET, REVISED NOTES, MISC. EDITS TO DRAWING.
- REV. 4-1-08: REMOVED TEMPORARY REFERENCE, REVISED GENERAL NOTES, AND DRAFTING EDITS.
- REV. 5-14-10: ADDED FILTER BAG SPECIFICATIONS.
- REV. 2-28-01: CORRECTED PAY ITEM NUMBER IN PLAN VIEW.
- REV. 5-27-01: CHANGED ITEM NOS. 209-08 TO 209-08.03, 209-08.10 TO 209-09.02 AND 303-15.01 TO 303-10.01. CHANGED DESCRIPTION IN ITEM NO. 209-20.03.
- REV. 12-18-02: CHANGED SILT FENCE (WITHOUT BACKING) TO SILT FENCE (WITH BACKING) IN PLAN AND SECTIONAL VIEW. CHANGED PAY ITEM FROM 209-08.03 TO 209-08.02 FOR SILT FENCE.

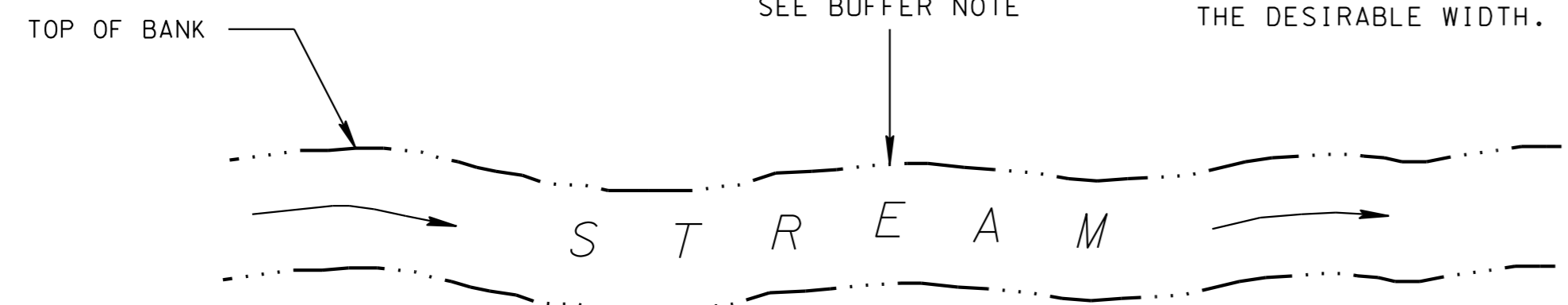


**SECTION A-A**

**SEDIMENT FILTER BAG GENERAL NOTES**

- (A) SPECIAL PROVISION 209B IS TO BE USED FOR SEDIMENT FILTER BAGS. ALL REFERENCES IN SPECIAL PROVISION 209B TO PUMPING FROM SEDIMENT TRAPS ALSO APPLIES TO PUMPING FROM COFFERDAMS.
- (B) SEDIMENT FILTER BAG INSTALLATION, INCLUDING DOWNSLOPE GEOTEXTILE AND SILT FENCE WITH WIRE BACKING SHOULD NOT BE PLACED WITHIN A JURISDICTIONAL WETLAND OR WITHIN 15 FEET (30 FEET DESIRABLE) OF A STABILIZED OUTLET, STREAM, OR OTHER NATURAL WATER RESOURCE. WHEN DISCHARGING TO SEDIMENT-IMPAIRED STREAMS OR EXCEPTIONAL TENNESSEE WATERS, THE BUFFER SHALL BE A MINIMUM OF 30 FEET WITH A DESIRABLE WIDTH OF 60 FEET. BUFFER REQUIREMENT DOES NOT APPLY TO ANY LOCATION ON SITE WITH A VALID ARAP OR EQUIVALENT PERMIT BY FEDERAL AGENCIES.
- (C) CONTRACTOR SHALL EXERCISE CAUTION NOT TO BURST OR DAMAGE THE SEDIMENT FILTER BAG WHEN PUMPING.
- (D) THE LENGTH AND WIDTH OF THE SEDIMENT BAG SHOWN ON THIS DRAWING MAY VARY PER VENDOR SPECIFICATIONS. THE MINIMUM "FOOTPRINT" OF THE BAG SHALL BE 150 SQUARE FEET.
- (E) SEDIMENT FILTER BAGS MAY BE EQUIPPED WITH A SEWN-IN SLEEVE OF SUFFICIENT SIZE TO ACCEPT A MINIMUM FOUR-INCH DIAMETER PUMP DISCHARGE HOSE. A HOSE CONNECTION THROUGH A SLIT IN THE BAG IS ALSO ACCEPTABLE. THE DISCHARGE HOSE SHOULD BE EXTENDED INTO THIS SLEEVE A MINIMUM OF SIX INCHES AND BE TIGHTLY SECURED WITH A HOSE CLAMP OR OTHER SUITABLE MEANS TO PREVENT LEAKAGE.
- (F) THE PUMP DISCHARGE HOSE CONNECTION SLEEVE, OR SLIT, SHALL BE SECURELY TIED OFF DURING DISPOSAL OF THE SEDIMENT FILTER BAG IN ORDER TO PREVENT LEAKAGE OF COLLECTED SEDIMENTS.
- (G) ONLY GEOTEXTILE FABRIC (TYPE III) LISTED ON THE QUALIFIED PRODUCTS LIST SHALL BE USED.
- (H) SURROUND SEDIMENT FILTER BAG ASSEMBLY WITH SILT FENCE WITH WIRE BACKING. SEE STANDARD DRAWING EC-STR-3C AND EC-STR-3E FOR INSTALLATION DETAILS.
- (I) EXISTING VEGETATIVE BUFFER TO REMAIN BETWEEN SILT FENCE WITH WIRE BACKING AND STABILIZED OUTLET, STREAM OR OTHER NATURAL WATER RESOURCE. BUFFER ZONE EXEMPTIONS ARE DEFINED BASED ON EXISTING LAND USES.
- (J) SEDIMENT TUBES OR FILTER SOCKS MAY BE USED AS AN ALTERNATIVE TO SILT FENCE WITH WIRE BACKING. SEE STANDARD DRAWINGS EC-STR-37 AND EC-STR-8 FOR INSTALLATION DETAILS. FILTER SOCKS MAY NOT REQUIRE STAKING WHEN APPROVED BY THE ENGINEER.
- (K) SEDIMENT FILTER BAGS SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBERS:
  - 209-09.03 SEDIMENT FILTER BAG (15' X 15') PER EACH
  - 209-09.04 SEDIMENT FILTER BAG (15' X 10') PER EACH
  - 303-10.01 MINERAL AGGREGATE (SIZE 57) PER TON
  - 740-10.03 GEOTEXTILE (TYPE III) (EROSION CONTROL) PER SQUARE YARD
- (L) WHEN SEDIMENT FILTER BAGS ARE REPLACED ONLY THE REPLACEMENT BAG SHALL BE PAID FOR. MAINTENANCE ON ALL OTHER PARTS OF THE SEDIMENT FILTER BAG ASSEMBLY SHALL BE INCLUDED IN THE INITIAL PAYMENT.
- (M) ONLY SEDIMENT FILTER BAGS LISTED ON THE QUALIFIED PRODUCTS LIST MAY BE USED.
- (N) SEDIMENT FILTER BAGS SHALL BE REPLACED WHEN SEDIMENT HAS ACCUMULATED TO ONE-HALF OF THE BAGS CAPACITY OR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

**BUFFER NOTE:**  
 ATTEMPTS SHOULD BE MADE TO PROVIDE THE DESIRABLE WIDTH AT ALL SITES. THE AVERAGE WIDTH OF THE BUFFER STRIP MAY BE USED WHEN CALCULATING THE DESIRABLE WIDTH.



**PLAN VIEW**

FILTER BAG SPECIFICATIONS		
PROPERTIES		TEST METHOD
WEIGHT	10.0 oz./yd.	ASTM D3776
TENSILE STRENGTH	250 lbs.	ASTM D4632
TENSILE ELONGATION AT BREAK	50%	ASTM D4632
PUNCTURE STRENGTH	115 lbs.	ASTM D4833
TRAPEZOIDAL TEAR	100 lbs.	ASTM D4533
MULLEN BURST	350 lbs.	ASTM D3786
WATER FLOW RATE	80 gpm/ft. <sup>2</sup>	ASTM D4491
PERMITTIVITY	1.2 sec.-1	ASTM D4491
UV RESISTANCE	70% str. Ret.	ASTM D4355

STANDARD BAG MINIMUM DIMENSIONS	MAXIMUM FLOW RATE
15 X 10 ft.	up to 1500 gpm
15 X 15 ft.	up to 2000 gpm

**NOTE:**  
 THE MATERIAL SHALL BE A NON-WOVEN GEOTEXTILE FABRIC BAG RESISTANT TO ROT, MILDEW, PUNCTURE AND TEARING, WITH A MINIMUM SEAM BREAKING STRENGTH OF 200 LBS (90 Kgs) THE SEAMS SHALL DEMONSTRATE LESS ELONGATION AND DEFORMATION OF THE GEOTEXTILE FABRIC.

**EROSION CONTROL PLAN LEGEND: SEDIMENT FILTER BAG**

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

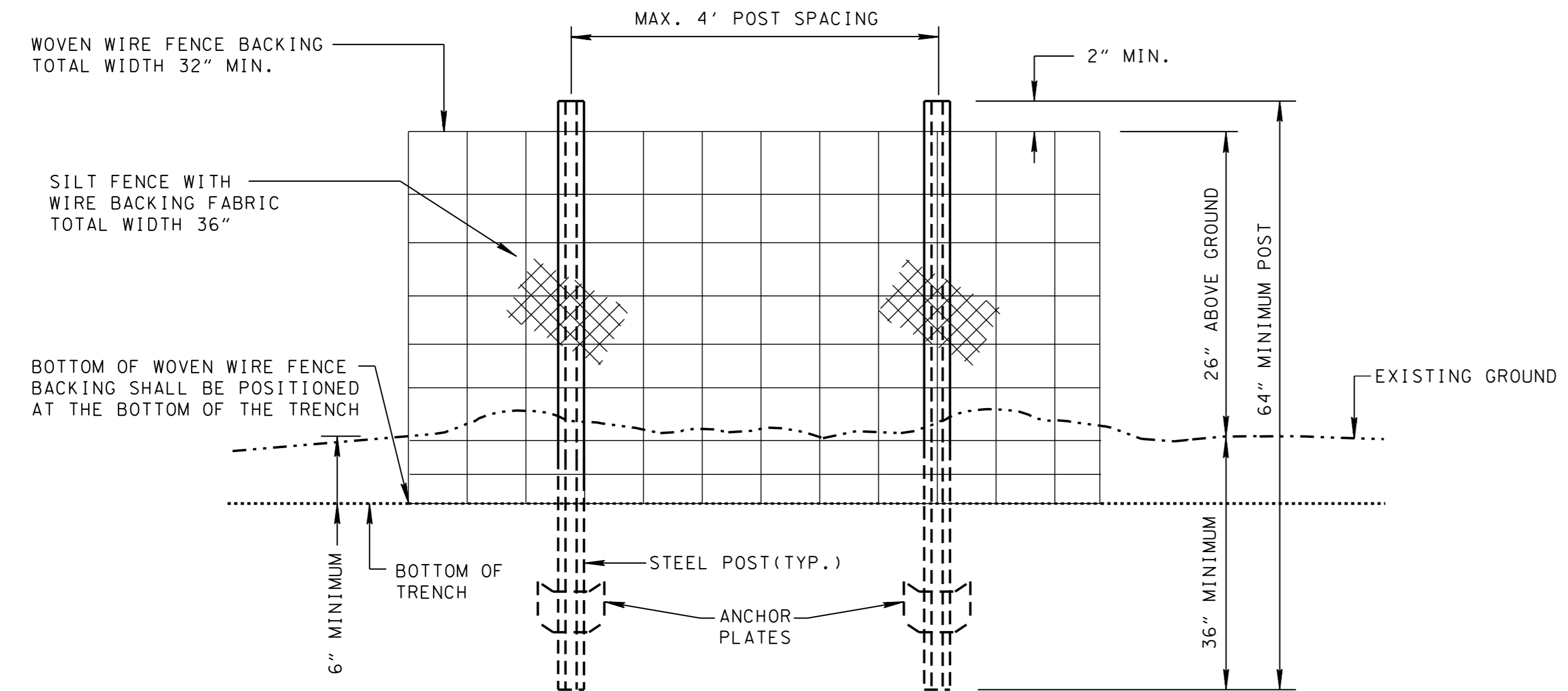
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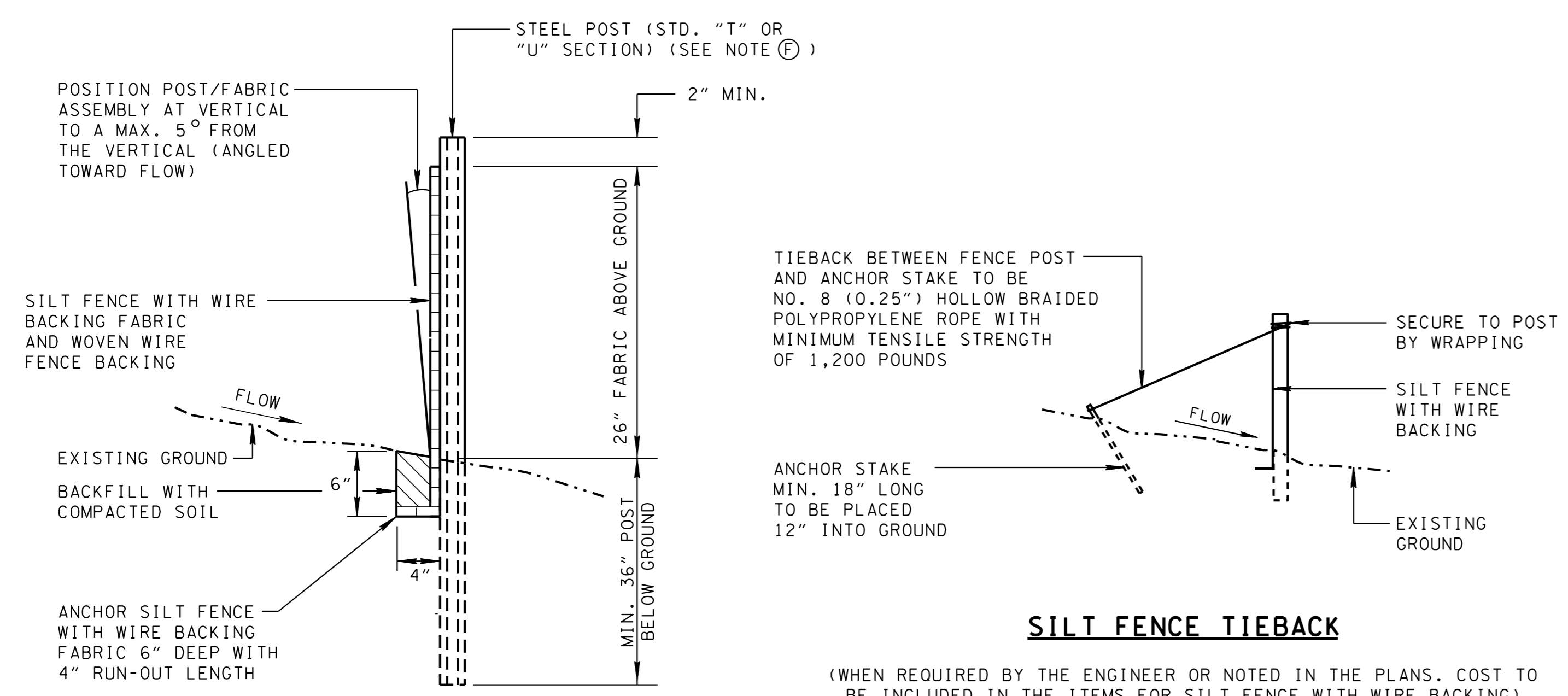
**SEDIMENT FILTER BAG**



- REV. 12-18-03: MODIFIED TABLE 2 AND GENERAL NOTE ⑥.
- REV. 7-29-04: CHANGED VALUES IN TABLE 2 FROM MEAN TO MARV VALUES.
- REV. 4-15-06: MODIFIED FABRIC HEIGHT. ADDED NOTES ⑦ AND ⑧. REVISED TABLE TITLE. REORDERED GENERAL NOTES. REFORMATTED SHEET, REVISED NOTES, MISC. EDITS TO DRAWING.
- REV. 4-1-08: REMOVED TEMPORARY REFERENCE, REVISED NOTES, AND MISC. EDITS TO DRAWING.
- REV. 8-1-12: MINOR EDITS TO GENERAL NOTES.



**ELEVATION VIEW**



**SECTIONAL VIEW**

**SILT FENCE TIEBACK**

(WHEN REQUIRED BY THE ENGINEER OR NOTED IN THE PLANS. COST TO BE INCLUDED IN THE ITEMS FOR SILT FENCE WITH WIRE BACKING)

SILT FENCE WITH WIRE BACKING FABRIC SPECIFICATIONS	
FABRIC PROPERTY AND TEST METHODS	REQUIRED PHYSICAL PROPERTIES (MARV VALUES OF TEST DATA)
GEOTEXTILE FABRIC TYPE	WOVEN MONOFILAMENT
APPARENT OPENING SIZE (ASTM D4751)	# 70 TO # 100 STANDARD SIEVE
WATER FLUX (ASTM D4491)	≥ 18 GPM/FT <sup>2</sup>
TENSILE STRENGTH (ASTM D4632)	≥ 310 LB. (WARP DIRECTION) X 200 LB. (FILL DIRECTION)
ULTRAVIOLET STABILITY (AFTER 500 HRS PER ASTM D4355)	≥ 90%
BURST STRENGTH (ASTM D3786)	≥ 400 PSI
PUNCTURE STRENGTH (ASTM D4833)	≥ 105 LB.
TRAPEZOIDAL TEAR (ASTM D4533)	≥ 100 LB. (WARP DIRECTION) X 60 LB. (FILL DIRECTION)

**SILT FENCE WITH WIRE BACKING GENERAL NOTES**

- ① SILT FENCE WITH WIRE BACKING IS USED TO INTERCEPT SMALL AMOUNTS OF SEDIMENT AND REDUCE VELOCITY FROM SHEET FLOW ONLY. USE SILT FENCE WITH WIRE BACKING UP-GRADE TO, AND ALONG THE PERIMETER OF STREAMS, WETLANDS, PONDS, SPRINGS, OR OTHER NATURAL WATER RESOURCES LOCATED WITHIN OR ADJACENT TO THE PROJECT RIGHT-OF-WAY AND AT LARGE FILL SLOPES.
- ② THE MAXIMUM DRAINAGE AREA SIZE FOR CONTINUOUS SILT FENCE WITH BACKING SHALL BE 1 ACRE PER 150 LINEAR FEET OF FENCE LENGTH. MAXIMUM SLOPE LENGTH BEHIND FENCE ON UPSLOPE SIDE SHALL BE 290 FEET (AS MEASURED ALONG THE GROUND SURFACE).
- ③ WHEN INSTALLED AT THE TOE OF A SLOPE SILT FENCE WITH WIRE BACKING SHOULD BE PLACED 5 FEET TO 10 FEET AWAY FROM THE TOE TO ALLOW SPACE FOR PONDING OF WATER, COLLECTION OF SEDIMENT, AND EASE OF MAINTENANCE AND REMOVAL.
- ④ WHEN TWO SECTIONS OF SILT FENCE WITH WIRE BACKING FABRIC ADJOIN EACH OTHER, THEY SHALL BE JOINED ACCORDING TO THE DETAILS ON STANDARD DRAWING EC-STR-3E.
- ⑤ MAINTENANCE SHALL BE PERFORMED AS NEEDED; CAPTURED SOIL MATERIAL SHALL BE REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE AND/OR WHEN EVIDENCE OF FILTER CLOGGING IS OBSERVED.
- ⑥ STEEL POSTS SHALL BE ROLLED FROM HIGH CARBON STEEL AND SHALL HAVE A MINIMUM WEIGHT OF 1.25 LB/FT. POSTS SHALL BE HOT-DIPPED GALVANIZED OR PAINTED WITH HIGH GRADE WEATHER RESISTANT STEEL PAINT. STEEL POSTS SHALL BE EQUIPPED WITH AN ANCHOR PLATE HAVING A MINIMUM AREA OF 14 SQUARE INCHES. POSTS SHALL BE STUDDED, EMBOSSED, OR PUNCHED TO AID IN THE ATTACHMENT OF THE WIRE BACKING. POSTS AND ANCHOR PLATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A702.
- ⑦ STEEL POSTS SHALL HAVE A PROJECTION FOR FASTENING WIRE TO THEM. WOVEN WIRE FENCE BACKING TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES. THE WIRE FASTENERS SHOULD BE EVENLY SPACED WITH AT LEAST SIX PER POST.
- ⑧ FABRIC SHALL BE FASTENED SECURELY TO WOVEN WIRE FENCE BACKING WITH THE TIES SPACED EVERY 24 INCHES ALONG TOP AND MIDSECTION.
- ⑨ WOVEN WIRE FENCE BACKING SHALL MEET THE REQUIREMENTS FOR ASTM A-116 FOR NO. 11 FARM, DESIGN NO. 832-6-11, CLASS 3 COATING.
- ⑩ SILT FENCE WITH BACKING SHOULD BE PLACED ALONG OR NEAR THE GROUND CONTOUR. THE BOTTOM OF FENCE AT GROUNDLINE SHOULD BE ON A ZERO PERCENT (0%) GRADE, PLUS OR MINUS FIVE TENTHS OF ONE PERCENT (±0.5%). THE END OF A ROW OF SILT FENCE WITH WIRE BACKING SHOULD BE TURNED UP SLOPE FORMING A J-HOOK TO FILTER ANY CONCENTRATED FLOW BEHIND FENCE.
- ⑪ FOR TRENCH-BASED INSTALLATIONS, SILT FENCING WITH WIRE BACKING SHALL BE INSTALLED PER THE FOLLOWING STEPS AND IN THE FOLLOWING ORDER:
  - EXCAVATE TRENCH A MAXIMUM OF 4 INCHES WIDE AND 6 INCHES DEEP. THE TRENCH SHALL BE HAND-CLEANED FOLLOWING EXCAVATION TO REMOVE BULKY DEBRIS SUCH AS ROCKS, STICKS, AND SOIL CLOUDS FROM THE TRENCH.
  - DRIVE AND SET SUPPORT POSTS PER SPACING REQUIREMENTS GIVEN ON THE APPLICABLE FENCE DETAIL.
  - ATTACH WOVEN WIRE FENCE BACKING TO POSTS AND FABRIC TO THE WIRE BACKING USING WIRE TIES. SPACING AND DENSITY OF TIES SHALL BE INSTALLED ACCORDING TO NOTES G AND H
  - INSTALL FABRIC IN TRENCH.
  - BACKFILL TRENCH (OVER-FILL) WITH SOIL PLACED AROUND FABRIC.
  - COMPACT SOIL BACKFILL WITH MECHANICAL EQUIPMENT. DO NOT DAMAGE THE FABRIC DURING COMPACTION (DAMAGED FABRIC SHALL BE REPLACED).
- ⑫ ONLY SILT FENCE WITH WIRE BACKING FABRIC LISTED ON THE QUALIFIED PRODUCTS LIST MAY BE USED. ANY PRODUCTS LISTED ON THE QUALIFIED PRODUCTS LIST AS AN APPROVED ALTERNATE MAY ALSO BE USED.
- ⑬ SILT FENCE WITH WIRE BACKING SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBER:
 

209-08.02 TEMPORARY SILT FENCE (WITH BACKING) PER LINEAR FOOT

PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF THE SILT FENCE WITH WIRE BACKING.
- ⑭ SEDIMENT SHALL BE REMOVED FROM BEHIND THE SILT FENCE WITH WIRE BACKING WHEN IT HAS ACCUMULATED TO ONE-HALF THE ORIGINAL HEIGHT OF THE STRUCTURE AND PAID FOR UNDER ITEM NUMBER 209-05, SEDIMENT REMOVAL PER CUBIC YARD.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

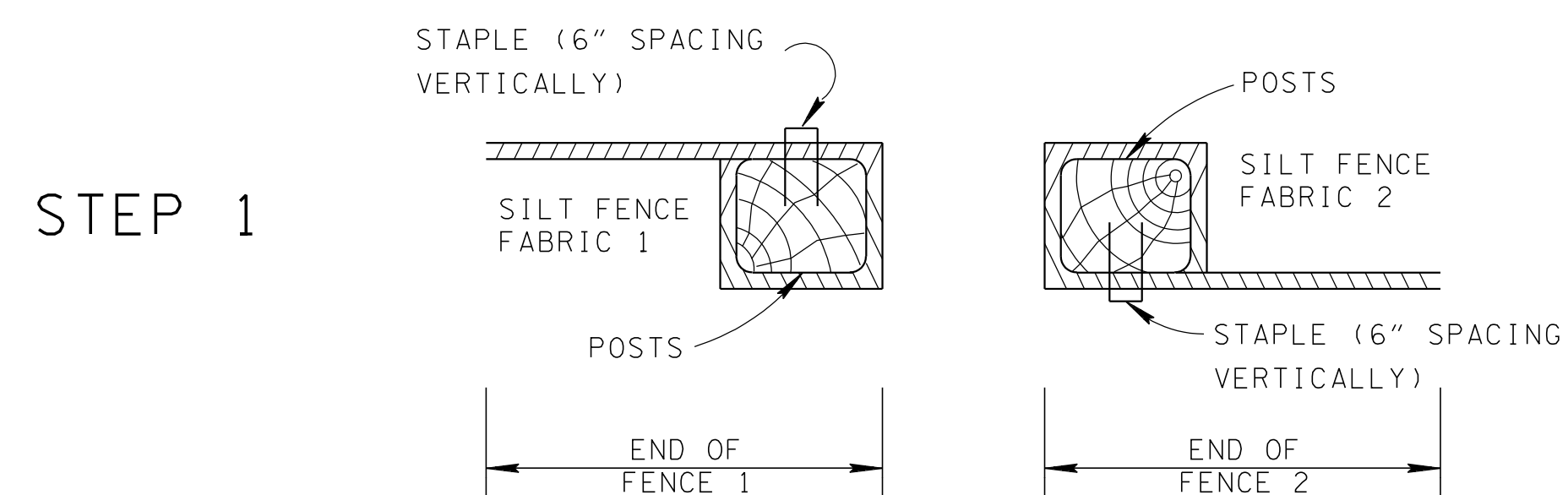
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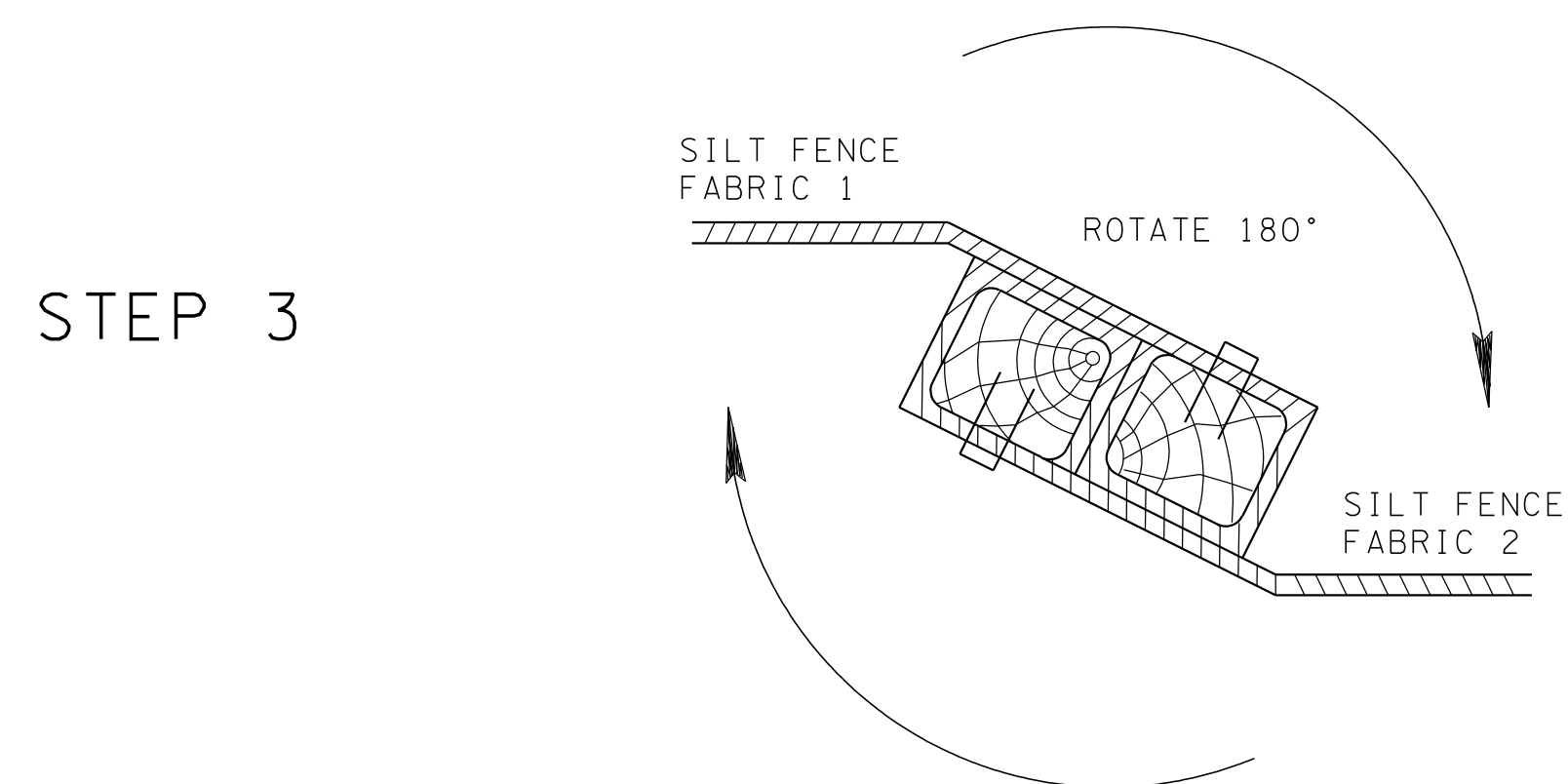
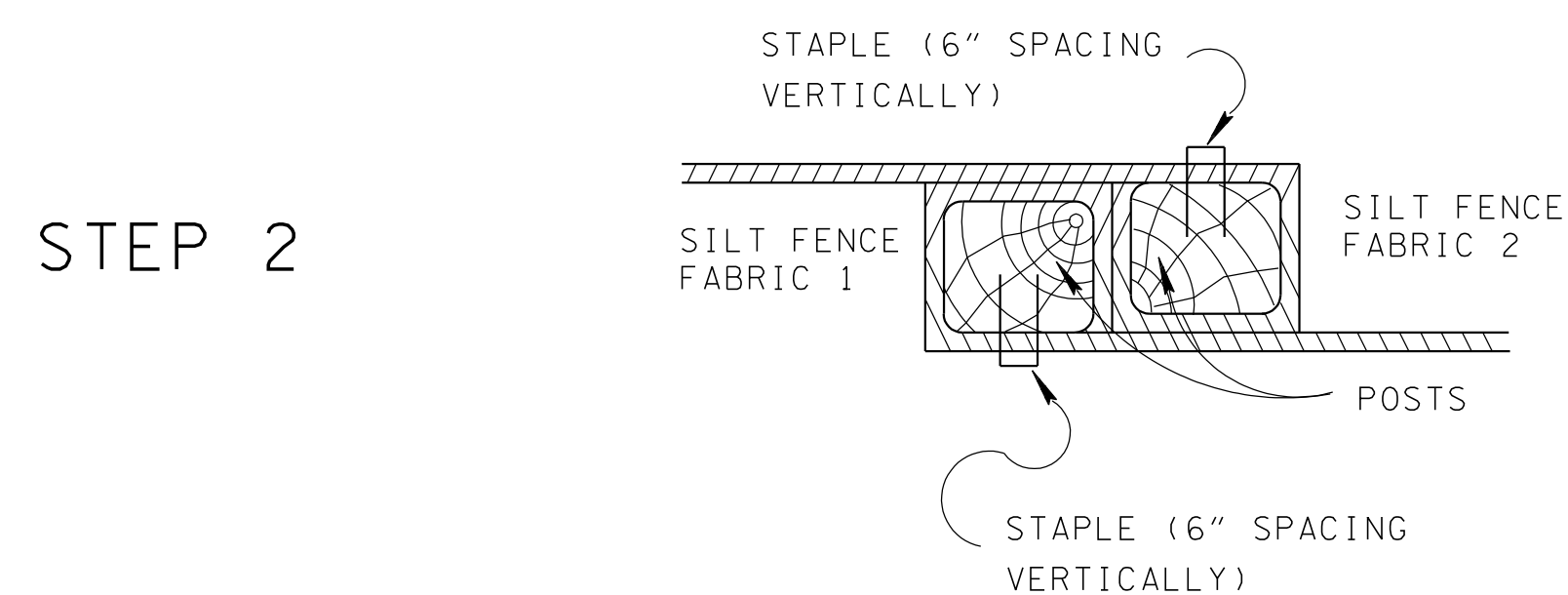
**SILT FENCE WITH WIRE BACKING**

EROSION CONTROL PLAN LEGEND: \* SFB \* SFB \* SFB \* SILT FENCE WITH WIRE BACKING



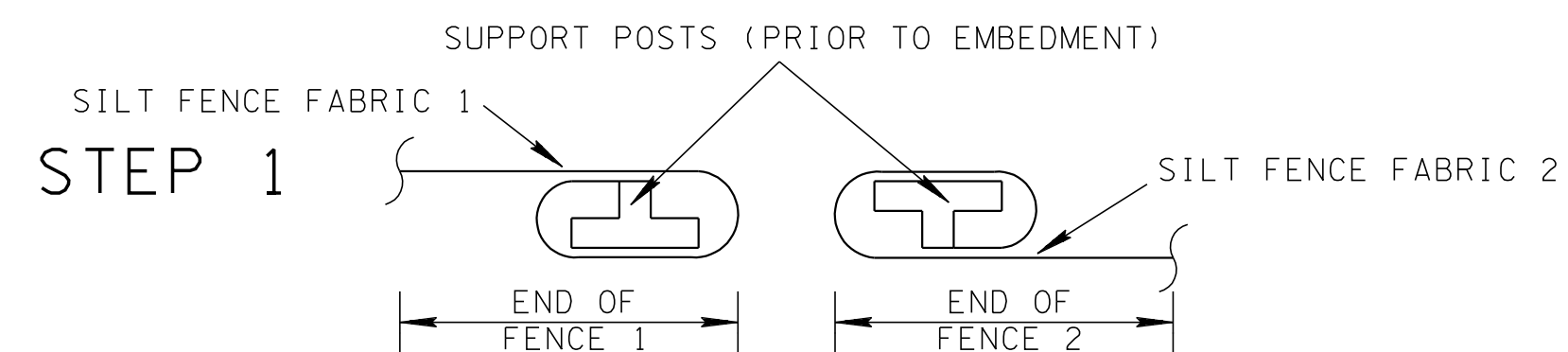


- ① WRAP FABRIC AROUND END SUPPORTS AS SHOWN AND ANCHOR FABRIC TO POSTS.
- ② POSITION POSTS/FABRIC AS SHOWN ABOVE.

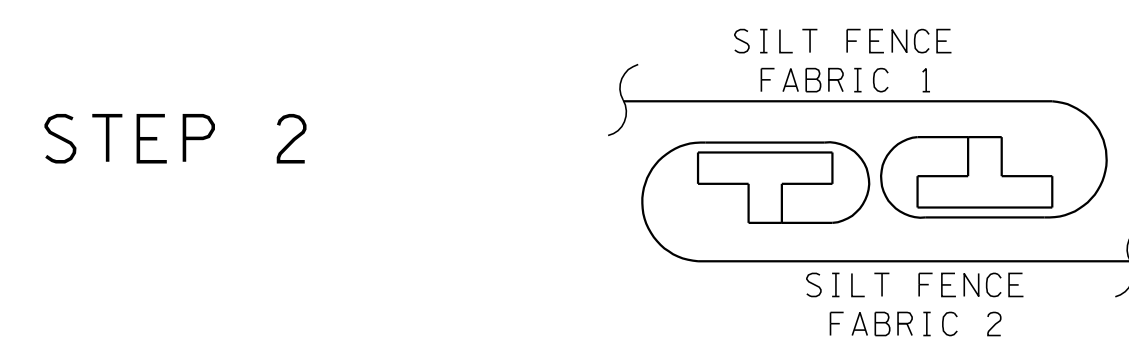


- ① ROTATE BOTH POSTS WITH FABRIC CLOCKWISE AT LEAST 180°.
- ② EMBED BOTH POSTS INTO GROUND PER SILT FENCE STANDARD DRAWING EC-STR-3B.

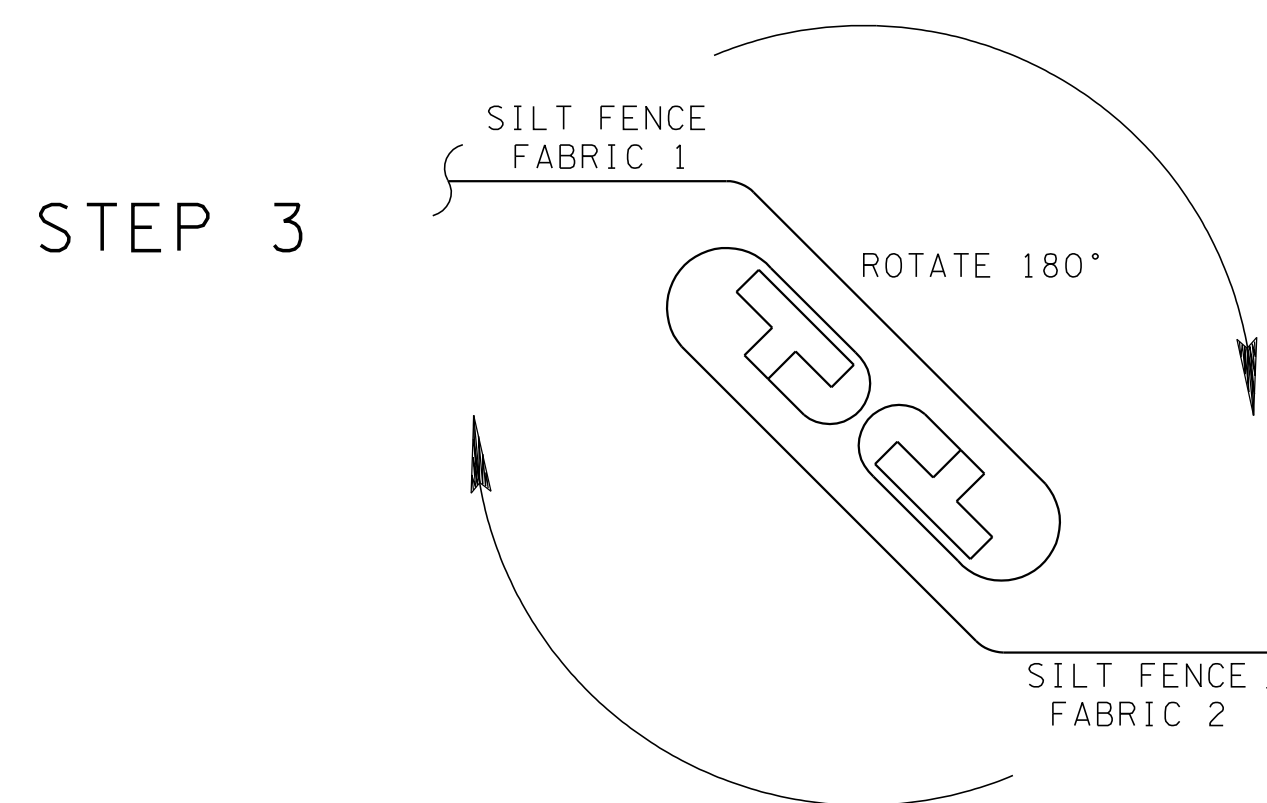
**PLAN VIEW**  
**JOINING SILT FENCE**  
**FABRIC SECTIONS (WOOD POSTS)**



- ① WRAP FABRIC AROUND END SUPPORTS AS SHOWN AND ANCHOR FABRIC TO POSTS.
- ② POSITION POSTS/FABRIC AS SHOWN ABOVE.



- ① POSITION THE SILT FENCE FABRIC 2 POST INSIDE OF THE SILT FENCE FABRIC 1 POST AS SHOWN ABOVE.



- ① ROTATE BOTH POSTS WITH FABRIC CLOCKWISE AT LEAST 180°.
- ② EMBED BOTH POSTS INTO GROUND PER APPLICABLE SILT FENCE STANDARD DRAWING. (EC-STR-3B, EC-STR-3C, OR EC-STR-3D)

**PLAN VIEW**  
**JOINING SILT FENCE**  
**FABRIC SECTIONS (STEEL POSTS)**

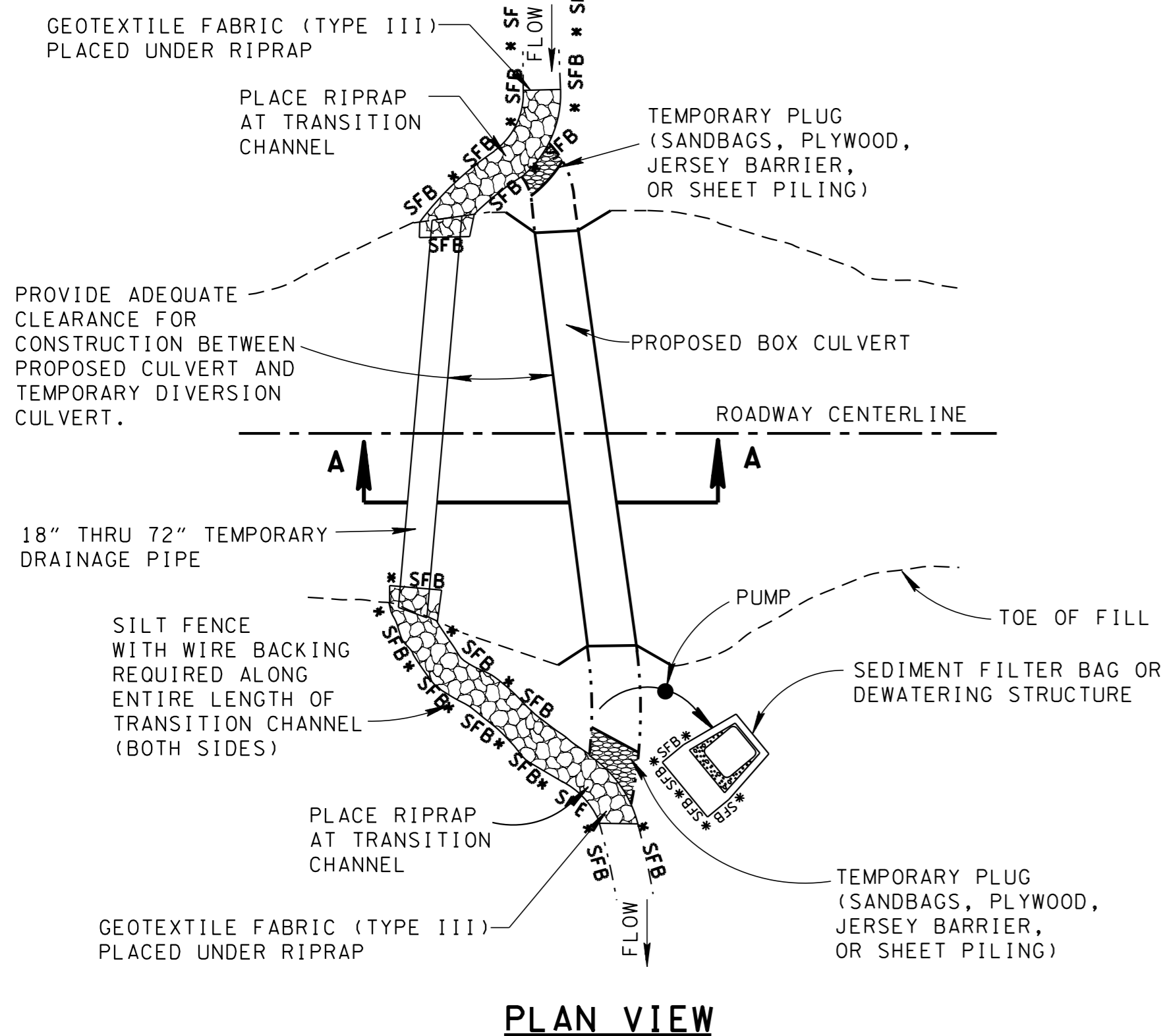
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SILT FENCE  
 FABRIC JOINING  
 DETAILS

12-18-02 EC-STR-3E

## TEMPORARY DIVERSION CULVERT WITH CHANNEL TRANSITIONS



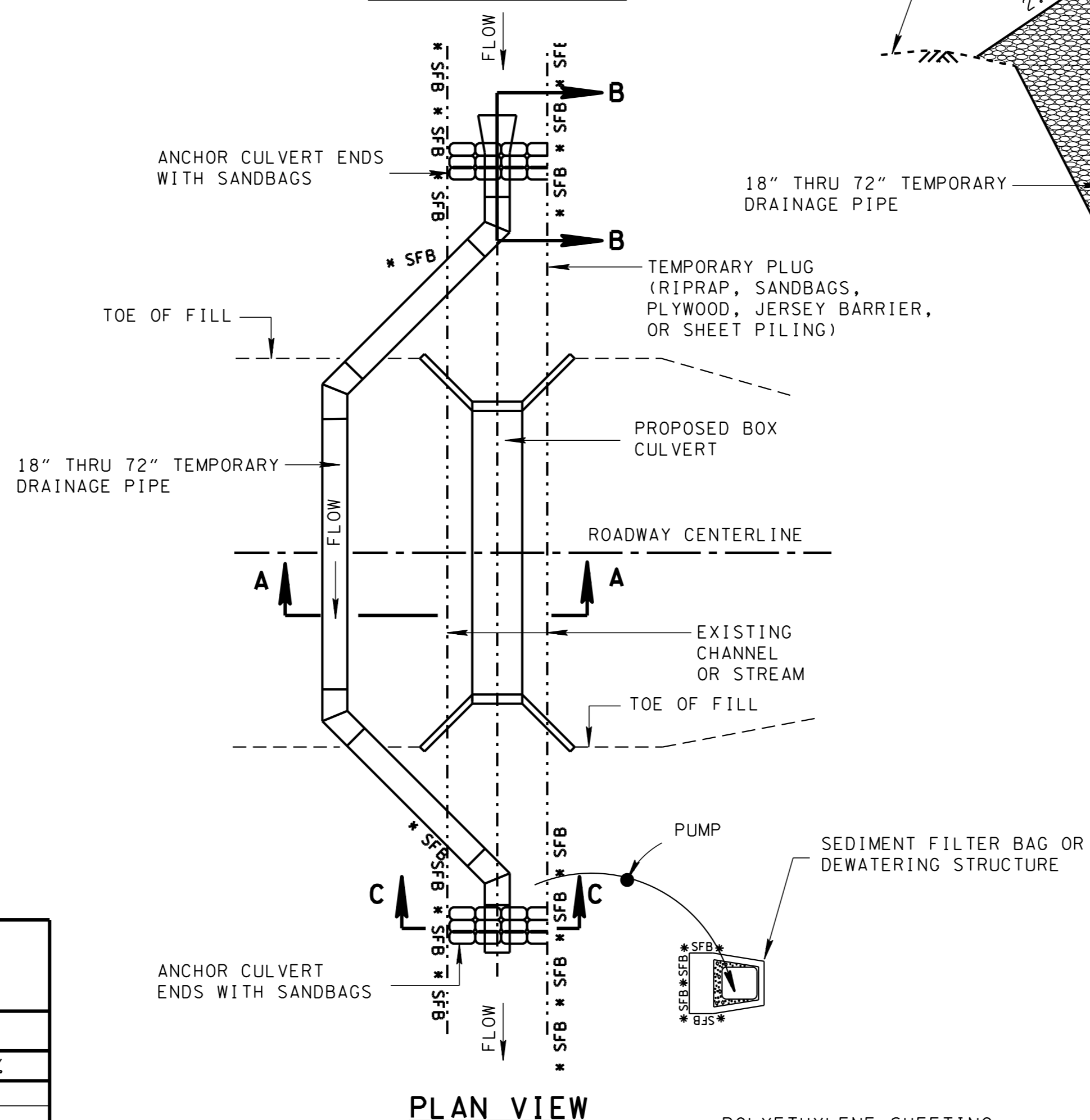
PLAN VIEW

TEMPORARY DIVERSION CULVERT SELECTION						
FLOW CAPACITY IN CFS OF A GIVEN PIPE AT A GIVEN CHANNEL SLOPE						
PIPE DIAMETER (INCHES)	AVERAGE CHANNEL SLOPE					
	0.5%	1%	1.5%	2.0%	2.5%	3.0%
18	8.5	9.1	9.8	10.4	11.0	11.3
24	17.4	18.8	20.0	21.4	21.5	21.7
30	30.1	32.3	33.9	34.1	33.5	33.0
36	46.8	50.4	49.5	47.8	46.6	45.8
42	67.7	69.0	65.5	62.8	61.0	59.6
48	92.6	88.1	76.8	78.6	75.8	73.7
54	127.2	107.0	91.9	94.9	91.1	88.1
60	146.5	121.1	118.4	111.1	106.1	101.9
72	194.9	142.2	153.6	141.3	133.3	127.9
RIPRAP	B	B	B	B	B/C	B/C

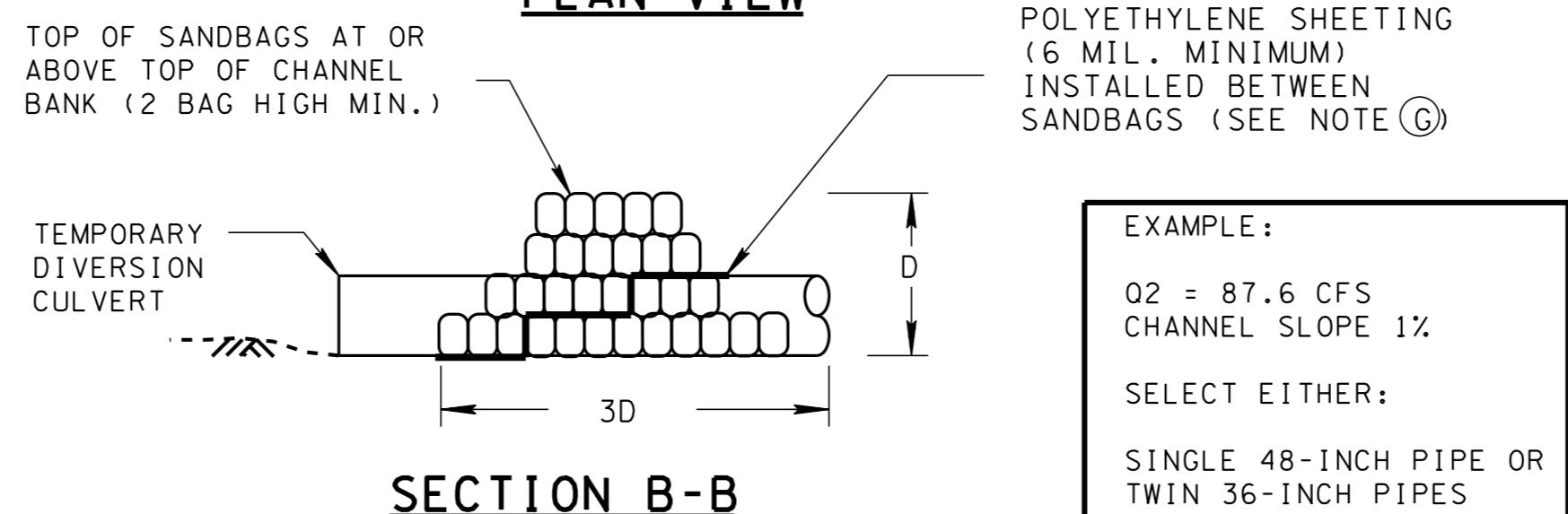
NOTES: FLOW RATES BASED ON 2.5-FOOT INCREASE IN WATER SURFACE ELEVATION ABOVE NORMAL LEVEL FOR THE 2-YEAR, 24 HOUR STORM EVENT

ASSUMES CORRUGATED PIPE (n = 0.024)

## TEMPORARY DIVERSION CULVERT WITH ELBOWS

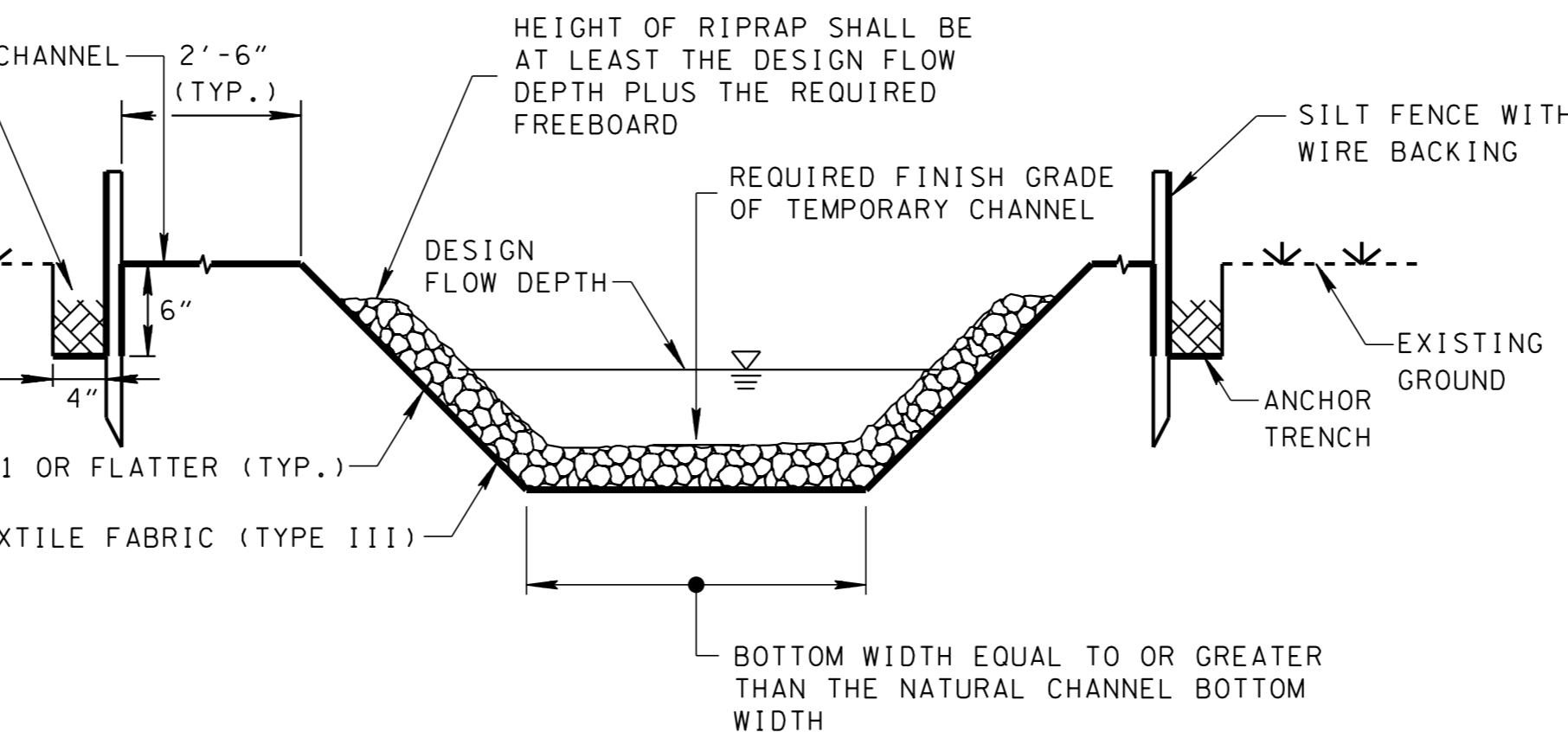


PLAN VIEW

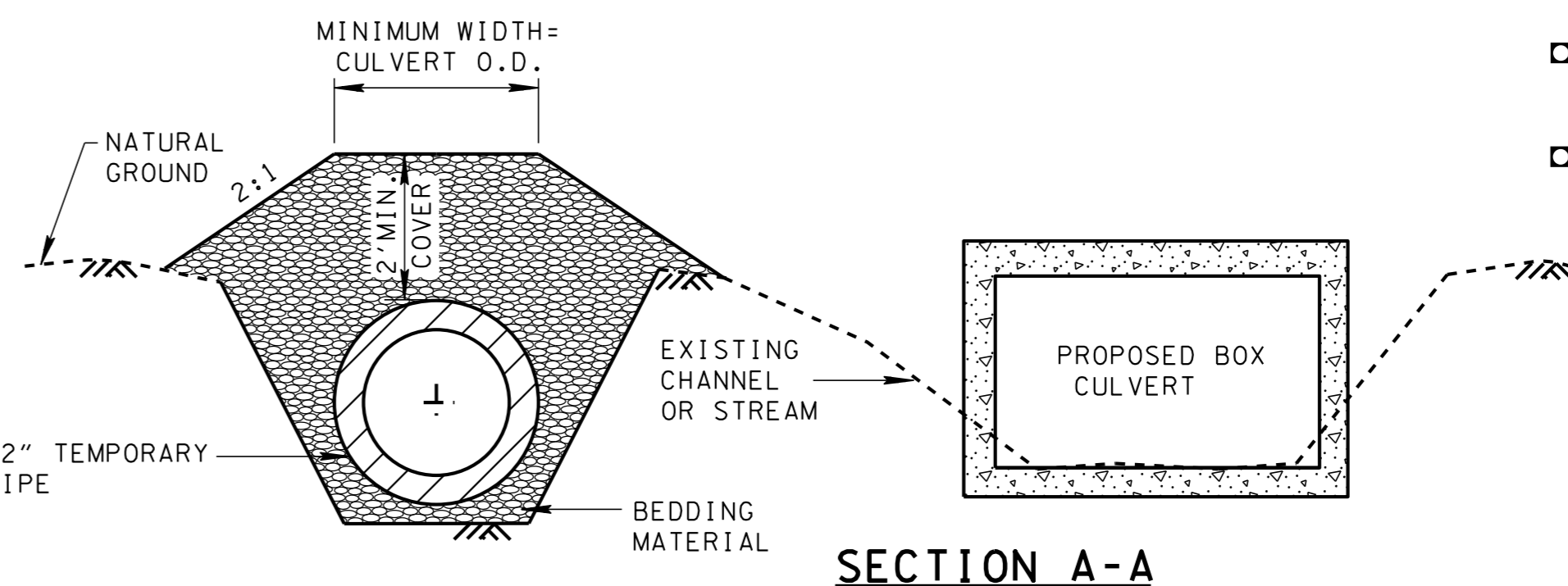


SECTION B-B

EXAMPLE:  
Q2 = 87.6 CFS  
CHANNEL SLOPE 1%  
SELECT EITHER:  
SINGLE 48-INCH PIPE OR  
TWIN 36-INCH PIPES



TRANSITION CHANNEL CROSS-SECTION



SECTION A-A

## TEMPORARY DIVERSION CULVERTS GENERAL NOTES

- (A) TEMPORARY DIVERSION CULVERTS ARE GENERALLY CONSTRUCTED UNDER AN EXISTING ROADWAY, WHERE IT IS NECESSARY TO MAINTAIN TRAFFIC, TO CONVEY STREAM FLOW AROUND IN-STREAM CONSTRUCTION. THIS ALLOWS IN-STREAM WORK TO BE COMPLETED IN THE DRY, SEPARATED FROM FLOWING WATER.
- (B) EXAMPLE SHOWN IS FOR CULVERT REPLACEMENT OR NEW CONSTRUCTION. OTHER PROJECTS WOULD BE CONSTRUCTED IN A SIMILAR MANNER.
- (C) TEMPORARY DIVERSION CULVERTS SHALL BE DESIGNED USING A 2-YEAR FREQUENCY STORM FLOW RATE. AT SITES WHICH INVOLVE EXCEPTIONAL TENNESSEE WATERS OR SEDIMENT-IMPAIRED STREAMS, THE PIPE SHALL BE ADEQUATE TO CONVEY THE 5-YEAR, PEAK FLOW. THE TABLE "TEMPORARY DIVERSION CULVERT SELECTION" MAY BE USED AS A GUIDELINE FOR DETERMINING THE PIPE SIZE. FOR ANY SITE WHERE  $Q_{50}$  EXCEEDS 500 CFS, THE DESIGN OF THIS MEASURE SHOULD BE COMPLETED BY THE HYDRAULICS SECTION OF THE STRUCTURES DIVISION.
- (D) THE DESIGNER SHALL PROVIDE CULVERT SECTIONS FOR TEMPORARY CULVERT CROSSINGS. MINIMUM COVER FOR CONSTRUCTION LOADS IS 2 FEET.
- (E) THE RIPRAP TRANSITION AT THE INLET AND THE DIVERSION CULVERT SHALL BE DESIGNED IN ACCORDANCE WITH APPROVED TOOT METHODS.
- (F) WHERE EXCAVATION FOR A DIVERSION TRANSITION EXPOSES BEDROCK, GEOTEXTILE FABRIC AND RIPRAP SHALL BE USED ONLY ON THE SIDES OF THE CHANNEL.
- (G) IN ORDER TO PROVIDE THE BEST POSSIBLE SEAL, THE POLYETHYLENE SHEETING USED IN AN UPSTREAM PIPE ANCHOR SHOULD BE FITTED AROUND THE PIPE. SANDBAGS ON THE DOWNSTREAM SIDE OF THE SHEETING SHOULD BE PLACED FIRST, AND THE SHEETING PLACED ON THESE BAGS. THE REMAINING SANDBAGS WOULD THEN BE PLACED ON THE SHEETING. WHERE MULTIPLE SHEETS ARE USED, THEY SHOULD OVERLAP A MINIMUM OF 18 INCHES.
- (H) DURING CONSTRUCTION OF THE TEMPORARY DIVERSION CULVERT, DAMAGE TO THE EXISTING STREAM AND CANOPY SHALL BE MINIMIZED. ALL EXISTING VEGETATION OUTSIDE THE CUT AND FILL LINES BUT INSIDE THE RIGHT-OF-WAY SHALL NOT BE DISTURBED UNLESS IT INTERFERES WITH SAFETY STANDARDS. THE TEMPORARY CULVERT SHOULD BE LOCATED SO AS TO MINIMIZE THE LENGTH OF ANY TRANSITIONS REQUIRED.
- (I) DIVERSION CULVERT CONSTRUCTION SHALL BE COMPLETED IN THE DRY BEFORE DIVERTING WATER FROM THE EXISTING CHANNEL. WHERE THIS IS NOT FEASIBLE, TEMPORARY FLOW DIVERSION STRUCTURES CAN BE USED UNTIL WORK IS COMPLETE. THESE STRUCTURES CAN BE ANY NON-ERODIBLE MATERIAL.
- (J) CONSTRUCTION SHALL PROCEED AS FOLLOWS:
  1. CONSTRUCT THE TEMPORARY CULVERT ADJACENT TO THE PROPOSED PROJECT. ISOLATE THE TEMPORARY CHANNEL FROM THE EXISTING CHANNEL WITH TEMPORARY PLUGS.
  2. DIVERT FLOW BY MOVING THE TEMPORARY PLUGS FROM THE TEMPORARY CHANNEL TO THE EXISTING CHANNEL. A COFFER DAM MAY BE USED UPSTREAM TO PREVENT STREAM FLOW DURING THIS OPERATION.
  3. CONSTRUCT THE PROJECT IN THE EXISTING STREAM AND PLACE PERMANENT EROSION CONTROL ON THE EXISTING STREAM BANKS.
  4. WHERE A TEMPORARY PLUG IS REQUIRED AT THE DOWNSTREAM END OF THE DIVERSION, IT SHOULD BE REMOVED FIRST. THEN REMOVE THE UPPER PLUG IN ORDER TO RELEASE FLOW INTO THE RECONSTRUCTED CHANNEL.
  5. REMOVE LINING MATERIALS FROM THE DIVERSION TRANSITIONS, RESTORE THE AREA TO GRADE AND STABILIZE EXPOSED SOILS.
- (K) DIVERSION CULVERT, SANDBAG ANCHORS AND TRANSITIONS SHALL BE INSPECTED WEEKLY OR AFTER EVERY RAIN EVENT. ANY NEEDED REPAIRS SHALL BE DONE IMMEDIATELY.
- (L) ONLY GEOTEXTILE FABRIC (TYPE III) LISTED ON THE QUALIFIED PRODUCTS LIST SHALL BE USED.
- (M) FOR INSTALLATION DETAILS AND ITEM NUMBERS FOR DEWATERING STRUCTURES (EC-STR-1), SEDIMENT FILTER BAGS (EC-STR-2), AND SILT FENCE WITH WIRE BACKING (EC-STR-3C), SEE THEIR RESPECTIVE STANDARD DRAWINGS.
- (N) TEMPORARY DIVERSION CULVERTS SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBERS:
 

203-01	ROAD AND DRAINAGE EXCAVATION (UNCLASSIFIED) PER CUBIC YARD
209-09.01	SAND BAGS PER BAG
209-20.03	POLYETHYLENE SHEETING (6 MIL. MINIMUM) PER SQUARE YARD
621-03.02	THRU
621-03.11	THRU
709-05.06	MACHINED RIP-RAP (CLASS A-1) PER TON
709-05.08	MACHINED RIP-RAP (CLASS B) PER TON
709-05.09	MACHINED RIP-RAP (CLASS C) PER TON
740-10.03	GEOTEXTILE (TYPE III) (EROSION CONTROL) PER SQUARE YARD

DEWATERING STRUCTURES, SEDIMENT FILTER BAGS, AND SILT FENCE WITH WIRE BACKING SHALL BE PAID FOR ACCORDING TO THEIR RESPECTIVE STANDARD DRAWINGS.

TEMPORARY PLUGS SHALL BE PAID FOR UNDER THEIR RESPECTIVE ITEM NUMBERS.

PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF TEMPORARY DIVERSION CULVERTS.

- REV. 4-15-06: REFORMATTED SHEET, REVISED NOTES, MISC. EDITS TO DRAWING.
- REV. 4-1-08: REVISED GENERAL NOTES, ADDED NOTE N, MISC. EDITS TO DRAWING, AND CHANGED STANDARD SYMBOL.
- REV. 8-1-12: MINOR EDITS TO GENERAL NOTES.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

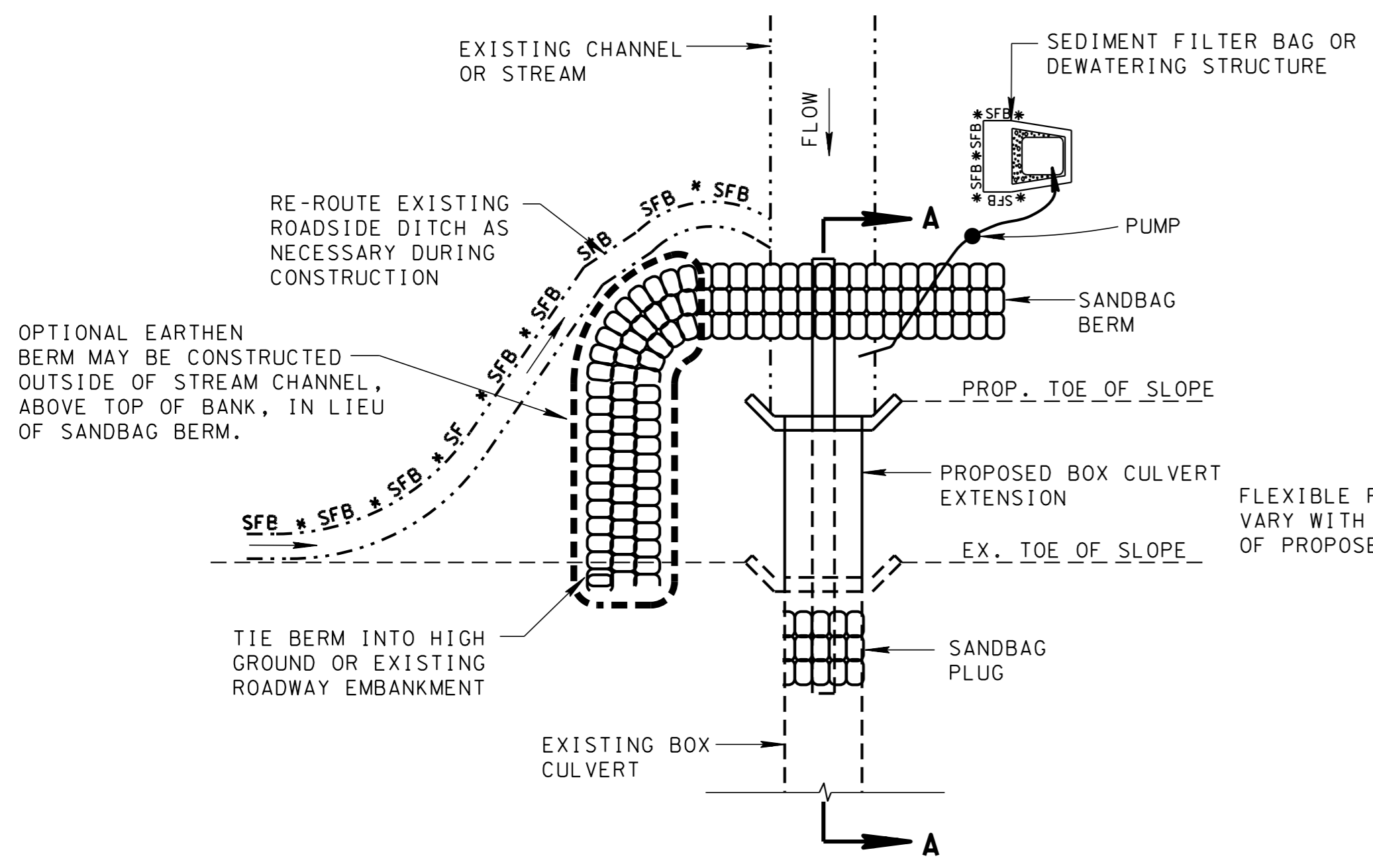
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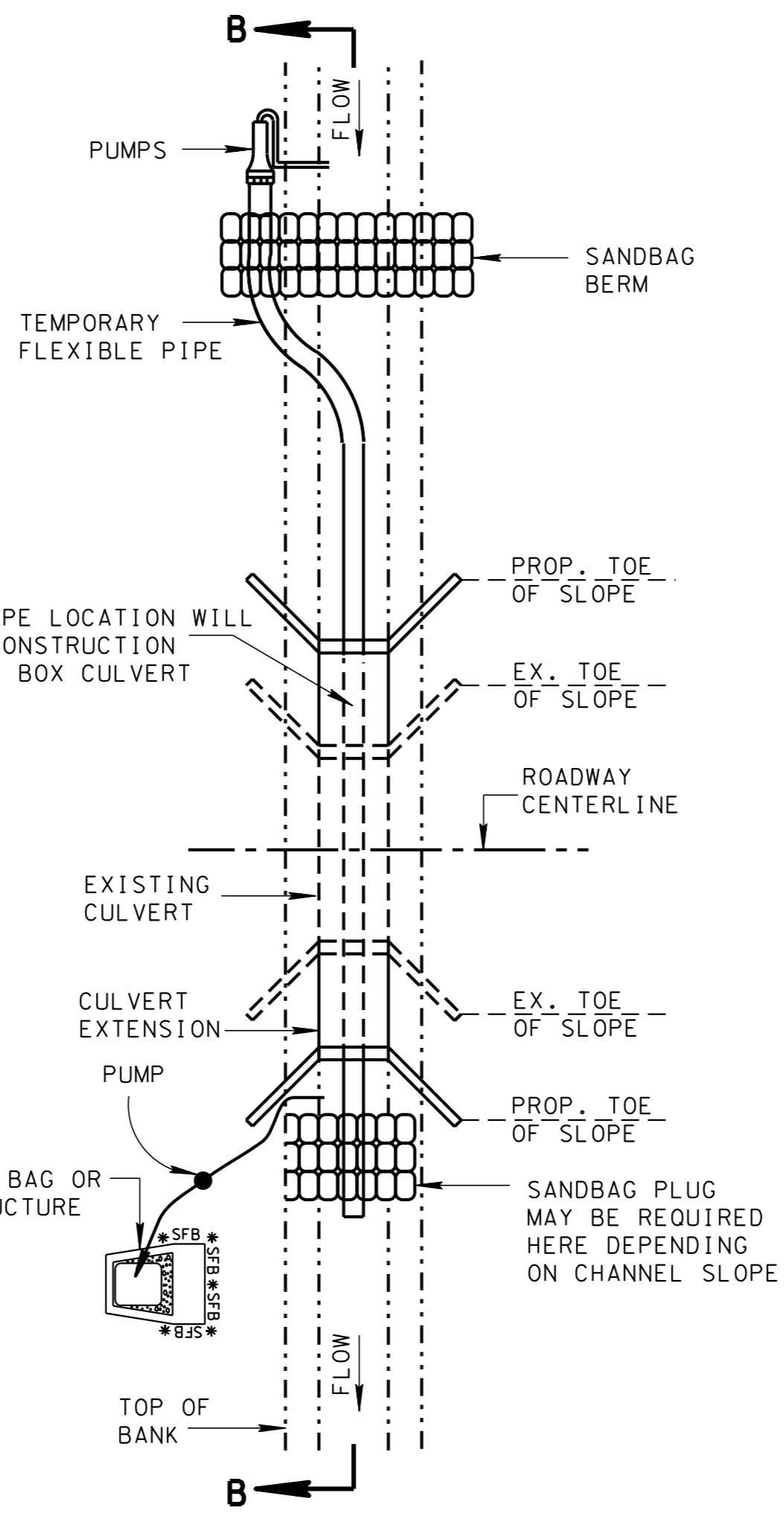
## TEMPORARY DIVERSION CULVERTS

EROSION CONTROL PLAN LEGEND: TEMPORARY DIVERSION CULVERT (DESCRIBE NUMBER AND SIZE OF PIPES)

### FLEXIBLE PIPE DIVERSION (OPTIONAL)

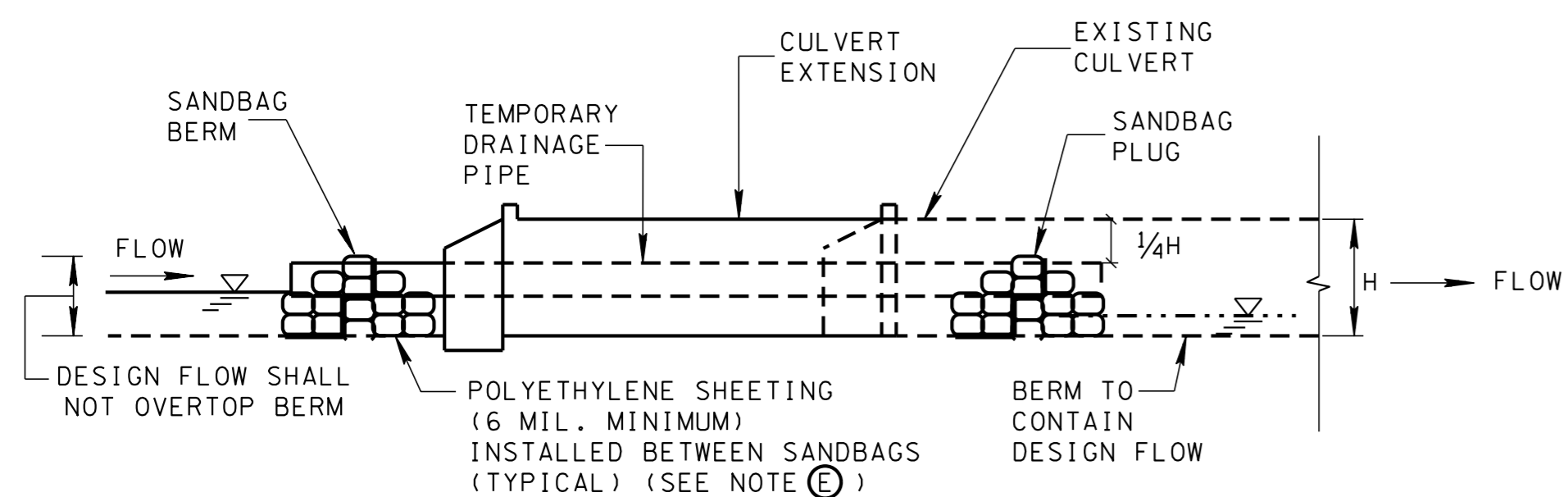


**PLAN VIEW**



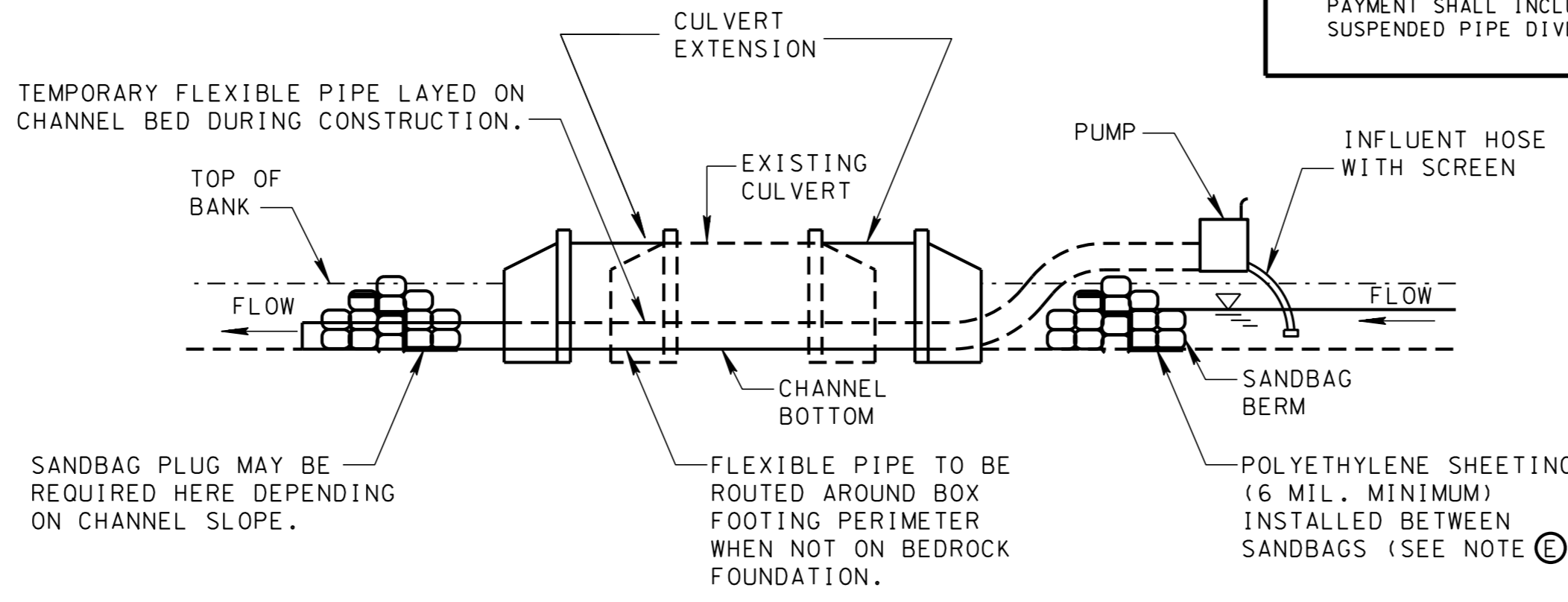
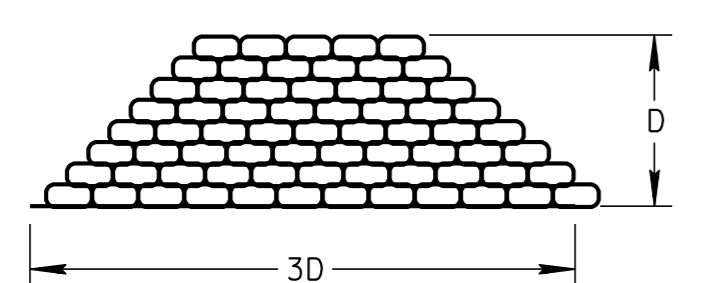
**PLAN VIEW**

(SHOWN WITH UPSTREAM & DOWNSTREAM EXTENTIONS)



**SECTION A-A**

**SAND BAG PLUG & BERM CROSS SECTION**  
(SEE NOTE C)



**SECTION B-B**

### SUSPENDED PIPE DIVERSION (UPSTREAM) GENERAL NOTES

- (A) SUSPENDED PIPE DIVERSIONS MAY BE USED TO ALLOW BOX CULVERT EXTENSIONS TO BE CONSTRUCTED, WHILE SEPARATED FROM FLOWING WATER, IN THE DRY, THUS REDUCING SEDIMENTATION. FLEXIBLE PIPE DIVERSION MAY BE UTILIZED ON STREAMS WITH INTERMITTENT FLOW WHERE THE DURATION OF CONSTRUCTION IS EXPECTED TO BE BRIEF.
  - (B) SUSPENDED PIPE DIVERSIONS SHALL BE DESIGNED USING A 2-YEAR STORM FREQUENCY FLOW RATE. AT SITES WHICH INVOLVE EXCEPTIONAL TENNESSEE WATERS OR SEDIMENT-IMPAIRED STREAMS, THE PIPE SHALL BE ADEQUATE TO CONVEY THE 5-YEAR, PEAK FLOW. THE TABLE "TEMPORARY DIVERSION CULVERT SELECTION" ON STANDARD DRAWING EC-STR-32 MAY BE USED AS A GUIDELINE FOR DETERMINING THE PIPE SIZE. FOR ANY SITE WHERE  $Q_{50}$  EXCEEDS 500 CFS, THE DESIGN OF THIS MEASURE SHOULD BE COMPLETED BY THE HYDRAULICS SECTION OF THE STRUCTURES DIVISION.
  - (C) SUSPENDED PIPE DIVERSIONS MAY BE USED WHERE ADVERSE IMPACTS WILL NOT BE CAUSED BY WATER PONDED UPSTREAM OF THE PIPE.
  - (D) THE SANDBAG PLUG AT THE DOWNSTREAM END OF THE SUSPENDED PIPE DIVERSIONS SHOULD BE CONSTRUCTED TO A HEIGHT EQUAL TO THREE QUARTERS OF THE RISE OF THE BOX CULVERT.
  - (E) POLYETHYLENE SHEETING (6 MIL. MINIMUM) SHALL BE PLACED INSIDE THE SANDBAG BERM IN THE CHANNEL AND THE SAND BAG PLUG IN THE BOX CULVERT, IN ORDER TO PROVIDE THE BEST POSSIBLE SEAL. SANDBAGS ON THE DOWNSTREAM SIDE OF THE SHEETING SHOULD BE PLACED FIRST, AND THEN SHEETING PLACED ON THESE BAGS. AS MUCH AS POSSIBLE, THE SHEETING SHOULD BE FITTED AROUND THE PIPE. THE REMAINING SANDBAGS WOULD THEN BE PLACED ON THE SHEETING. WHERE MULTIPLE SHEETS ARE USED, THEY SHOULD OVERLAP A MINIMUM OF 18 INCHES.
  - (F) THE PROPOSED CULVERT CONSTRUCTION SHALL BE SEALED FROM THE EXISTING STREAM BY MEANS OF A SANDBAG BERM WHICH WILL BE TIED IN TO EITHER HIGH GROUND BESIDE THE CHANNEL OR THE EXISTING ROADSIDE EMBANKMENT, UP TO THE 2-YEAR OR 5-YEAR FLOOD LEVEL.
  - (G) THE TEMPORARY DRAINAGE PIPE WILL BE SUPPORTED AT ALL JOINTS AND AT INTERVALS NOT TO EXCEED MAXIMUM VALUES SPECIFIED IN THE TABLE "MINIMUM SPAN FOR SUPPORTS." SUPPORTS MAY CONSIST OF SANDBAGS, CONCRETE BLOCKS, WOODEN FRAMES, OR ANY OTHER MATERIAL SUFFICIENT TO SUPPORT THE WEIGHT OF THE PIPE WHEN IT IS FLOWING FULL. SUPPORTS AT JOINTS SHALL BE A MINIMUM OF 18 INCHES IN LENGTH, ALONG THE TEMPORARY DRAINAGE PIPE AND CENTERED ON THE JOINT. SUPPORTS SHOULD "CRADLE" THE TEMPORARY DRAINAGE PIPE TO ENSURE THAT IT WILL NOT ROLL DURING CONSTRUCTION OF THE BOX CULVERT.
  - (H) ALL PIPE JOINTS SHALL BE PROPERLY Banded OR OTHERWISE PROVIDED WITH A REASONABLE SEAL AGAINST LEAKAGE.
  - (I) THE OPTIONAL FLEXIBLE PIPE DIVERSION CAN BE USED AS AN ALTERNATE FOR SUSPENDED PIPE DIVERSIONS (UPSTREAM OR DOWNSTREAM).
  - (J) CONSTRUCTION SHALL PROCEED AS FOLLOWS:
    1. INSTALL TEMPORARY DRAINAGE PIPE ON ITS SUPPORTS INSIDE THE CULVERT TO BE EXTENDED.
    2. CONSTRUCT THE SANDBAG BERM AT THE UPSTREAM END OF THE SUSPENDED PIPE DIVERSIONS.
    3. CONSTRUCT THE SANDBAG PLUG AT THE DOWNSTREAM END OF THE SUSPENDED PIPE DIVERSIONS.
    4. ONCE THE BOX CULVERT EXTENSION HAS BEEN COMPLETED, REMOVE THE DOWNSTREAM SANDBAG STRUCTURE, EXCEPT FOR THOSE BAGS NEEDED TO SUPPORT THE END OF THE PIPE. THE UPSTREAM SANDBAG STRUCTURE SHOULD THEN BE REMOVED GRADUALLY, IN ORDER TO ALLOW THE UPSTREAM WATER LEVEL TO DRAW DOWN AT A SAFE RATE.
    5. REMOVE THE TEMPORARY DRAINAGE PIPE, SUPPORTS AND ANY REMAINING SANDBAGS.
  - (K) TEMPORARY DRAINAGE PIPE, SANDBAG PLUGS, BERMS, AND SUPPORTS SHALL BE INSPECTED WEEKLY OR AFTER EVERY RAIN EVENT. ANY NEEDED REPAIRS SHALL BE DONE IMMEDIATELY. ANY DEBRIS WHICH HAS ACCUMULATED AT THE INLET OF THE SUSPENDED PIPE DIVERSIONS SHALL BE IMMEDIATELY REMOVED.
  - (L) FOR INSTALLATION DETAILS AND ITEM NUMBERS FOR DEWATERING STRUCTURES (EC-STR-1), SEDIMENT FILTER BAGS (EC-STR-2), AND SILT FENCE WITH WIRE BACKING (EC-STR-3C), SEE THEIR RESPECTIVE STANDARD DRAWINGS.
  - (M) SUSPENDED PIPE DIVERSIONS (UPSTREAM) SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBERS:
 

209-09.01	SANDBAGS PER BAG
209-20.03	POLYETHYLENE SHEETING (6 MIL. MINIMUM) PER SQUARE YARD
621-03.02	THRU
621-03.11	--" TEMPORARY DRAINAGE PIPE PER LINEAR FOOT
- DEWATERING STRUCTURES, SEDIMENT FILTER BAGS, AND SILT FENCE WITH WIRE BACKING SHALL BE PAID FOR ACCORDING TO THEIR RESPECTIVE STANDARD DRAWING.
- PUMPS AND FLEXIBLE PIPES SHALL BE PAID FOR UNDER THEIR RESPECTIVE ITEM NUMBERS.
- PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF SUSPENDED PIPE DIVERSIONS (UPSTREAM).

### MAXIMUM SPAN FOR PIPE SUPPORTS, FEET

DIAMETER OF PIPE (IN.)	STEEL THICKNESS (IN.)				
	0.064	0.079	0.109	0.138	0.168
2" X 1/2" CORRUGATION					
24	13	15	20		
36	12	15	20	25	
48	11	14	19	25	30
60		14	19	24	29
72			18	24	29
5" X 1" OR 3" X 1" CORRUGATION					
36	9	11			
48	9	11	15		
60	8	10	14	18	
72	8	10	14	18	22

FOR PIPE SIZES NOT SHOWN REFER TO NEXT LARGER SIZE

SOURCE: HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS, 1994, P. 278

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

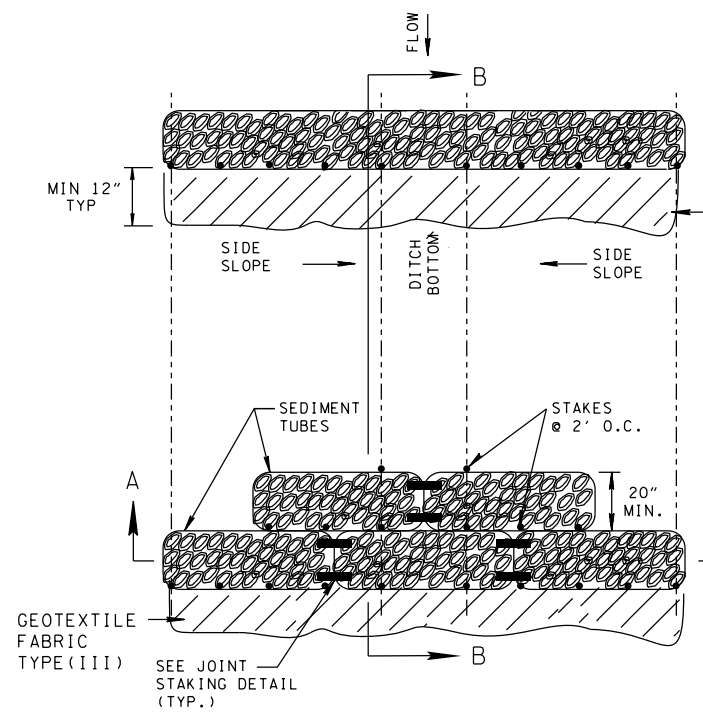
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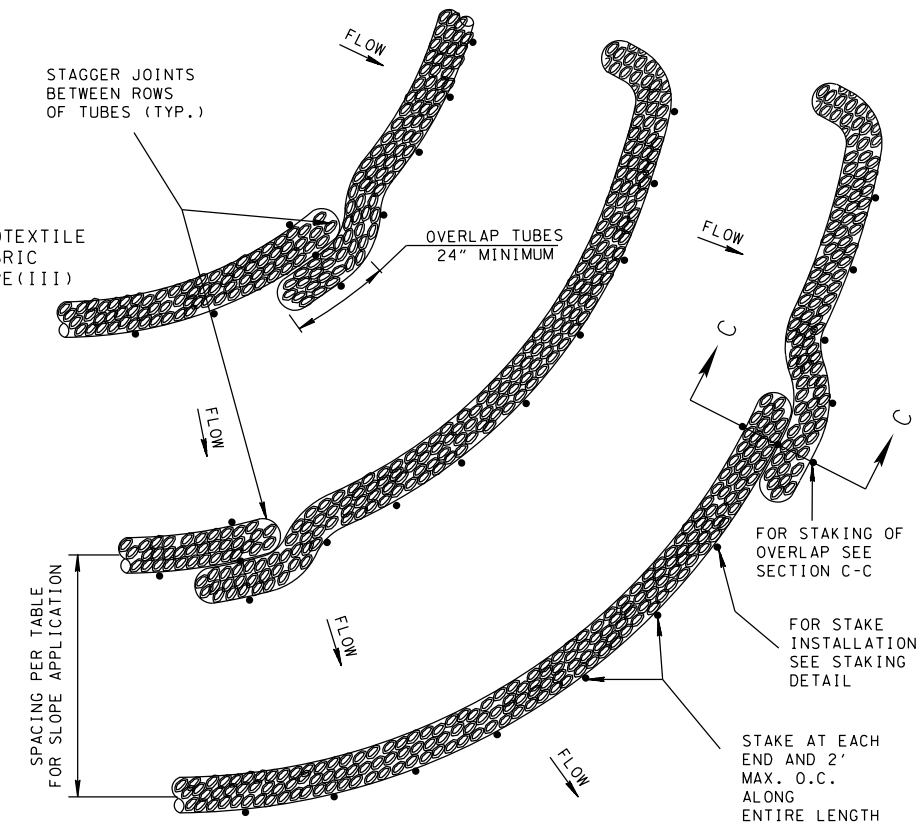
**SUSPENDED PIPE DIVERSION (UPSTREAM)**



- REV. 4-15-06: REFORMATTED SHEET, REVISED NOTES, MISC. EDITS TO DRAWING.
- REV. 4-1-08: REMOVED TEMPORARY REFERENCE, ADDED OVERLAP DETAIL, OTHER MINOR MISC. EDITS, REVISED GENERAL NOTES.
- REV. 8-1-12: MINOR EDITS TO GENERAL NOTES.
- REV. 6-10-14: MODIFIED SPACING TABLES. ADDED GEOTEXTILES ADDED NOTE (P).



PLAN VIEW FOR DITCH APPLICATION  
SEE NOTE (C)



PLAN VIEW FOR SLOPE APPLICATION

SLOPE	8"	12"	18"	20"	24"
2%	70'	80'	N/A	N/A	N/A
5%	30'	60'	80'	N/A	N/A
10%	20'	30'	70'	80'	80'
6:1	N/A	20'	40'	50'	55'
4:1	N/A	20'	30'	30'	30'
3:1	N/A	N/A	20'	20'	25'
2:1	N/A	N/A	20'	20'	20'

N/A = NOT RECOMMENDED  
SPACING NOT TO EXCEED 80'

SLOPE	MAXIMUM SEDIMENT TUBE SPACING
LESS THAN 2%	80'
2%	80'
3%	50'
4%	40'
5%	30'
6%	20'
GREATER THAN 6%	20'

BASED ON A 20" SEDIMENT TUBE  
SEE TABLE ON EC-STR-6 FOR OTHER HEIGHTS.

SEDIMENT TUBE GENERAL NOTES

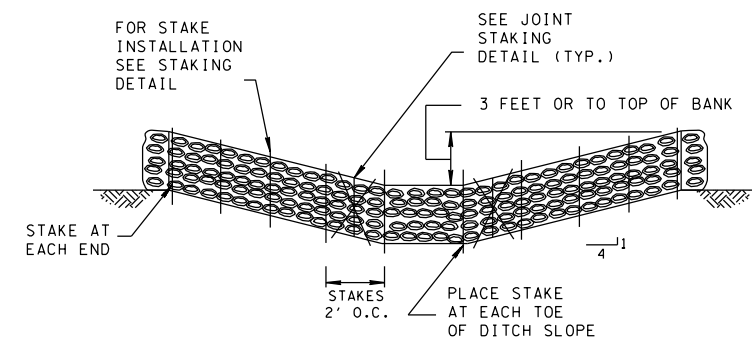
- (A) SEDIMENT TUBES CAN BE PLACED AT THE TOP, ON THE FACE, OR AT THE TOE OF SLOPES TO INTERCEPT RUNOFF, REDUCE FLOW VELOCITY, RELEASE THE RUNOFF AS SHEET FLOW AND PROVIDE REMOVAL OF SEDIMENT FROM THE RUNOFF.
- (B) SEDIMENT TUBES SHALL BE INSTALLED ALONG OR ON THE GROUND CONTOUR, AT THE TOE OF SLOPES, OR IN A DITCH TO HELP REDUCE THE EFFECTS OF SOIL EROSION AND RETAIN SEDIMENT. SEDIMENT TUBES SHOULD NOT BE USED IN DITCHES OR STREAMS.
- (C) FOR DITCH APPLICATIONS, THE MAXIMUM DRAINAGE AREA SHALL BE 15 ACRES. AT SITES WHICH DRAIN TO EXCEPTIONAL TENNESSEE WATERS OR SEDIMENT-IMPAIRED STREAMS, THE MAXIMUM DRAINAGE AREA SHALL BE 10 ACRES. FOR SLOPE APPLICATIONS, THE MAXIMUM DRAINAGE AREAS SHALL BE 1/4 ACRE PER 100 LF OF TUBE.
- (D) SEDIMENT TUBES SHALL NOT BE USED ON PAVEMENT, ROCKY SOILS, OR AT ANY OTHER LOCATIONS WHERE THE STAKES CANNOT BE DRIVEN TO THE REQUIRED DEPTH.
- (E) SEDIMENT TUBES SHALL BE MANUFACTURED FROM WOOD EXCELSIOR, RICE OR WHEAT STRAW, COCONUT FIBERS, OR HARDWOOD MULCH THAT IS ENCLOSED BY A TUBULAR FLEXIBLE NETTING MATERIAL. ALL MATERIALS INCLUDING THE NETTING SHALL BE BIODEGRADABLE.
- (F) PINE NEEDLE AND LEAF MULCH FILLED SEDIMENT TUBES AND STRAW BALES ARE NOT ACCEPTABLE MATERIALS.
- (G) THE DIAMETER OF A SEDIMENT TUBE SHALL BE A MINIMUM OF 8 INCHES AND A MAXIMUM OF 24 INCHES. DIAMETER TOLERANCE IS 2 INCHES. FOR DITCH APPLICATIONS, SEDIMENT TUBES SHALL BE A MINIMUM OF 20 INCHES.
- (H) SEDIMENT TUBES SHALL BE INSTALLED WITH WOODEN STAKES (MIN. 1.5" x 1.5" ACTUAL). THE STAKE SHALL BE EMBEDDED A MINIMUM OF 2 FEET.
- (I) SEDIMENT TUBES SHALL BE TRENCHED IN A MINIMUM OF 2 INCHES.
- (J) IF MORE THAN ONE SEDIMENT TUBE IS PLACED IN A ROW IN SLOPE APPLICATION, THE TUBES SHALL BE OVERLAPPED A MINIMUM OF 24 INCHES TO PREVENT FLOW AND SEDIMENT FROM PASSING THROUGH THE FIELD JOINT. WHEN USED IN DITCHES, TWO ROWS OF TUBE SHALL BE PLACED ON THE CHANNEL BOTTOM WITH STAGGERED JOINTS AS SHOWN.
- (K) FOR DITCH APPLICATIONS, SEDIMENT TUBES SHALL BE A MINIMUM OF 20 INCH DIAMETER AND SHALL BE PLACED PERPENDICULAR TO THE FLOW OF WATER. SEDIMENT TUBES SHALL CONTINUE UP THE SIDE SLOPES A MINIMUM OF 3 FEET PLUS THE DIAMETER OF THE TUBE, OR TO THE TOP OF THE DITCH, WHICHEVER IS LESS.
- (L) SEDIMENT TUBES USED IN SLOPE APPLICATIONS MAY REMAIN IN PLACE TO BIODEGRADE. FOR DITCH APPLICATIONS SEDIMENT TUBES SHALL BE COMPLETELY REMOVED AFTER FULLY ESTABLISHED VEGETATION HAS COMPLETELY DEVELOPED.
- (M) SEDIMENT TUBES SHALL BE PAID FOR UNDER THE FOLLOWING ITEMS NUMBERS:  
 740-11.01 TEMPORARY SEDIMENT TUBE (8 INCH) PER LINEAR FOOT  
 740-11.02 TEMPORARY SEDIMENT TUBE (12 INCH) PER LINEAR FOOT  
 740-11.03 TEMPORARY SEDIMENT TUBE (18 INCH) PER LINEAR FOOT  
 740-11.04 TEMPORARY SEDIMENT TUBE (20 INCH) PER LINEAR FOOT  
 740-11.05 TEMPORARY SEDIMENT TUBE (24 INCH) PER LINEAR FOOT  
 PAYMENT SHALL INCLUDE ALL MATERIALS (INCLUDING GEOTEXTILE FABRIC IF USED) AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF SEDIMENT TUBE.
- (N) ONLY SEDIMENT TUBES LISTED ON THE QUALIFIED PRODUCTS LIST MAY BE USED.
- (O) SEDIMENT SHALL BE REMOVED FROM BEHIND THE SEDIMENT TUBE WHEN IT HAS ACCUMULATED TO ONE-HALF THE ORIGINAL HEIGHT OF THE STRUCTURE AND PAID FOR UNDER ITEM NUMBER 209-05, SEDIMENT REMOVAL PER CUBIC YARD.
- (P) GEOTEXTILE FABRIC REQUIRED FOR SLOPE APPLICATION STEEPER THAN 6:1.

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

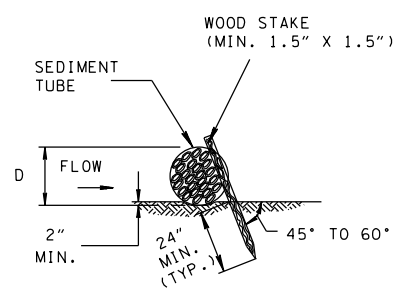
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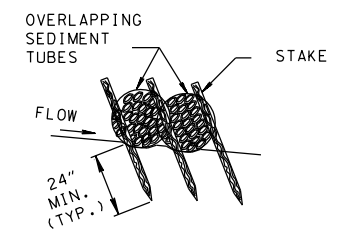
SEDIMENT TUBE



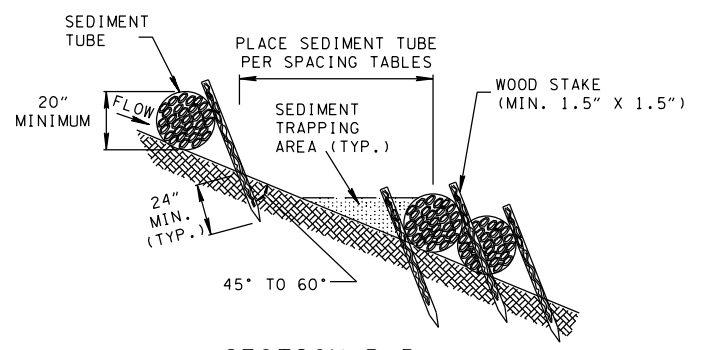
SECTION A-A



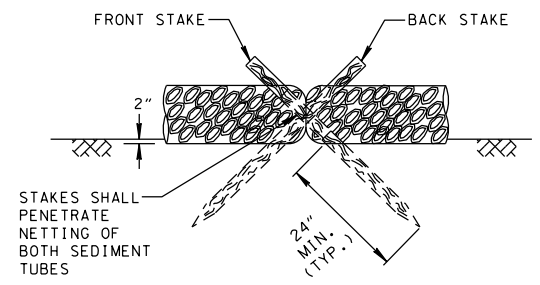
STAKING DETAIL



SECTION C-C

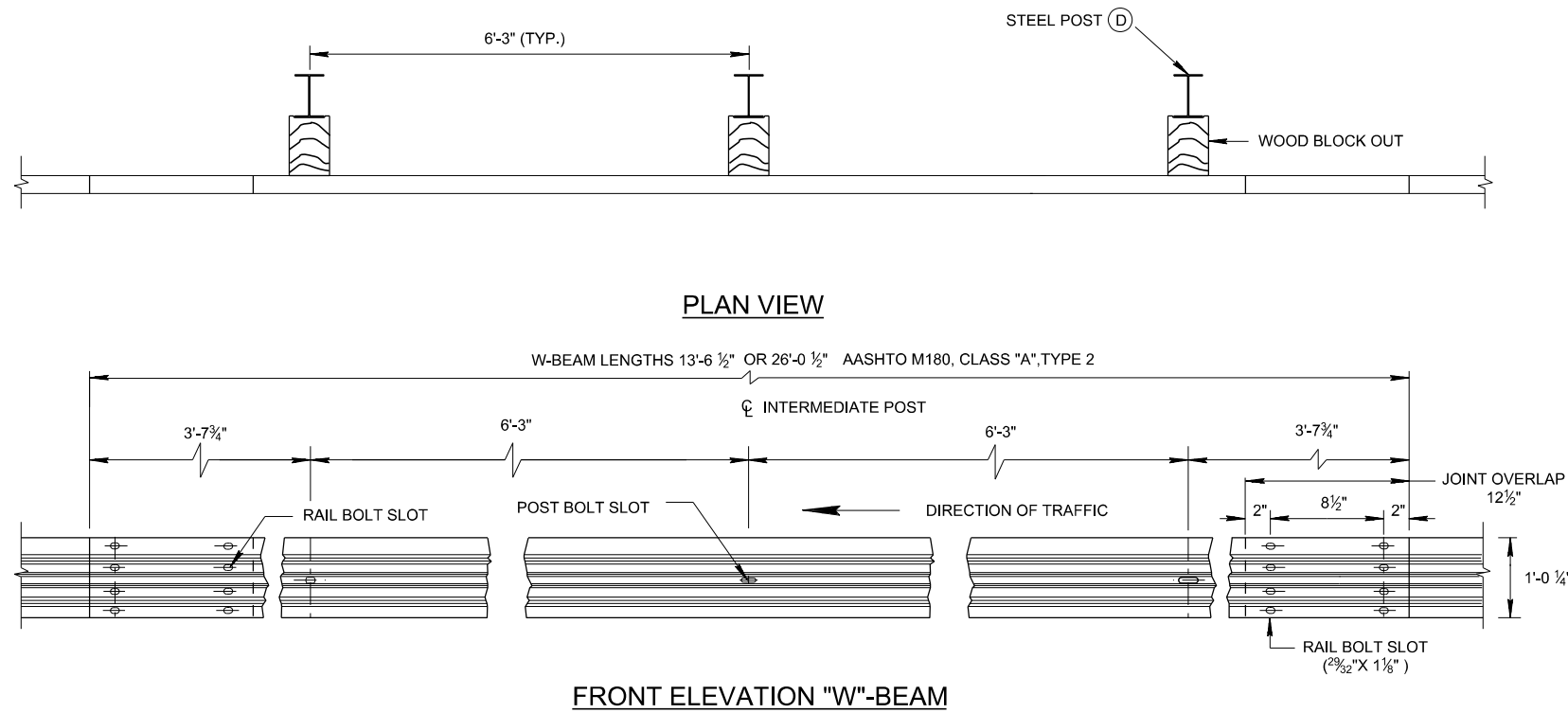


SECTION B-B

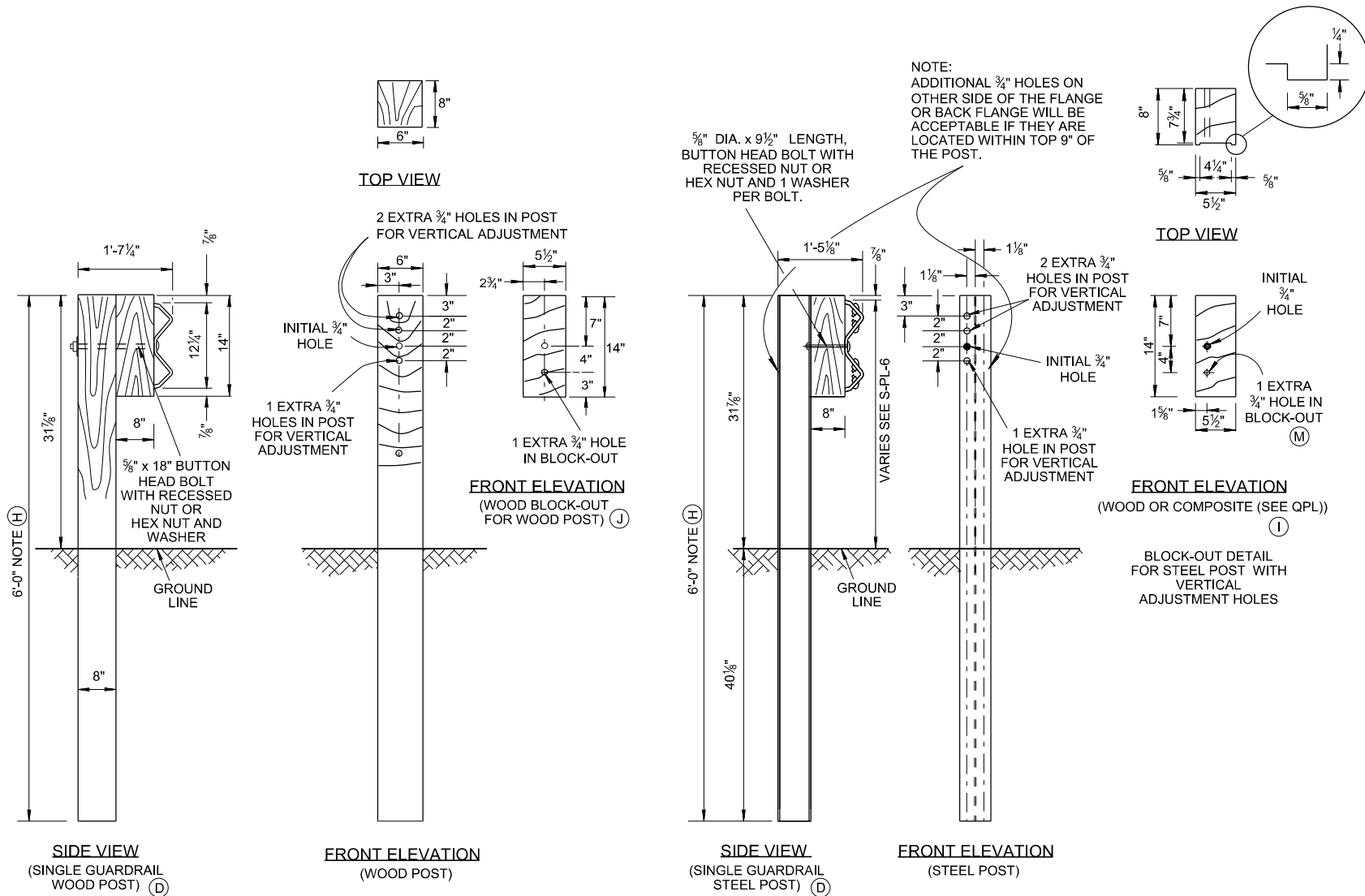


JOINT STAKING DETAIL  
(DITCH APPLICATION ONLY)

- REV. 12-1-14: REVISED NOTE (L)
- REV.4-4-16: REVISED NOTES.
- REV. 10-20-16: ADDED NOTE TO ADDRESS ADDITIONAL HOLES.
- REV. 3-28-17: REMOVED NOTE (T) CHANGED PAY ITEM NUMBER IMPROVED POST SIDE VIEWS AND FRONT ELEVATION VIEWS.



**FRONT ELEVATION "W"-BEAM**



NOTE: SIDE VIEW FOR STEEL POST DIMENSIONS BASED ON W6 X 8.5. OTHER DETAILS APPLY TO W6 X 9.0 AND W6 X 15.0 POSTS AND BLOCK-OUTS. SEE S-GR31-1A FOR FASTENING HARDWARE DETAILS.

**GENERAL NOTES**

**METAL BEAM**

- (A) METAL BEAMS SHALL CONFORM TO AASHTO M 180: TYPE 2, CLASS "A" UNLESS OTHERWISE NOTED ON THE PLANS.
- (B) WHERE GUARDRAIL IS PLACED ON A CURVE WITH A RADIUS LESS THAN 150 FEET, THE RAIL IS TO BE SHOP-FORMED TO THE REQUIRED RADIUS.
- (C) AT THE OPTION OF THE CONTRACTOR THE RAIL ELEMENTS FOR THE GUARDRAIL MAY BE FURNISHED IN EITHER 12'-6" OR 25' NOMINAL LENGTHS WITH POST BOLT SLOTS FOR CONNECTION TO POSTS.

**POSTS**

- (D) THE CONTRACTOR MAY HAVE THE CHOICE OF EITHER HOT ROLLED OR WELDED STEEL W6 X 8.5 OR W6 X 9 OR 8" X 6" WOOD POST. EXCEPT AS NOTED:
  - ① THE MIXING OF ANY POST TYPES ON A GIVEN PROJECT WILL BE AVOIDED IF AT ALL POSSIBLE.
  - ② SHOULD IT BECOME NECESSARY TO MIX POST TYPES ON A GIVEN PROJECT POSTS SHALL NOT BE MIXED ON A SINGLE RUN OF GUARDRAIL EXCEPT AS NECESSARY AT END TERMINALS.
  - ③ W6 X 15 IS USED WITH GUARDRAIL CONNECTION TO STRUCTURES.
- (E) STEEL POSTS SHALL CONFORM TO ASTM A36 AND BE GALVANIZED IN ACCORDANCE WITH ASTM A123. BOLT HOLES SHALL BE APPROXIMATELY CENTERED BETWEEN WEB AND EDGE OF FLANGE OF SPACERS AND POSTS.
- (F) WOOD POSTS SHALL CONFORM WITH TDOT CONSTRUCTION STANDARD SPECIFICATIONS.
- (G) WELDED STEEL POSTS SHALL CONFORM TO ASTM A769 AND BE GALVANIZED IN ACCORDANCE WITH ASTM A123, UNLESS OTHERWISE SPECIFIED ON THE PLANS.
- (H) ON STEEP SLOPES, WHEN GUARDRAIL IS PLACED AT SLOPE BREAK, MINIMUM POST LENGTH SHALL BE BASED ON TABLE ON STANDARD DRAWING S-PL-6. ADDITIONAL EXPENSE TO BE INCLUDED IN THE COST OF THE RUN OF GUARDRAIL.

**BLOCK OUTS**

- (I) BLOCK OUTS SHALL BE WOOD CONFORMING TO THE REQUIREMENTS OF TDOT CONSTRUCTION STANDARD SPECIFICATIONS OR PLASTIC GUARDRAIL BLOCK OUTS LISTED ON THE TDOT QUALIFIED PRODUCT LIST.
- (J) ONLY WOODEN BLOCK OUTS MAY BE USED WITH WOODEN POSTS, PLASTIC OR WOODEN BLOCK OUTS MAY BE USED WITH STEEL POSTS.
- (K) ALL BLOCK OUTS SHALL MEET MASH GUIDELINES.
- (L) MIXING THE BLOCK OUT MATERIAL ON A GIVEN PROJECT SHOULD BE AVOIDED. IF MIXING OF BLOCK OUT MATERIAL IS NECESSARY, BLOCK OUTS SHALL NOT BE MIXED ON A SINGLE RUN OF GUARDRAIL.

**FUTURE ADJUSTMENTS**

- (M) BLOCK OUTS SHALL HAVE ONE ADDITIONAL 3/4" HOLE, FOUR INCHES BELOW THE INITIAL HOLE FOR FUTURE ADJUSTMENT.
- (N) INITIAL INSTALLATION REQUIRES ONE BOLT CONNECTION, EACH ADJUSTMENT THEREAFTER REQUIRES TWO BOLT CONNECTIONS.

**END TREATMENTS**

- (O) ALL RUNS OF GUARDRAIL WILL BEGIN AND END WITH AN ANCHOR SYSTEM (SEE S-GRA-SERIES).
- (P) GUARDRAIL ENDS THAT ARE INSIDE THE CLEAR ZONE AND EXPOSED TO ONCOMING TRAFFIC SHALL HAVE A CRASH WORTHY END TERMINAL AS NOTED:
  - ① ANY ROAD WITH SUITABLE BACK SLOPES SHALL USE END TERMINALS BURIED IN BACK SLOPE (SEE S-GRT-1).
  - ② ALL HIGHWAY SYSTEM ROADS WITHOUT SUITABLE BACK SLOPES SHALL USE TANGENTIAL END TERMINALS (SEE S-GRT-2).
  - ③ ALL OTHER ROADS WITH POSTED SPEED < 45 MPH SHALL USE MASH TL-2 END TERMINALS UNLESS OTHERWISE NOTED (SEE S-GRT-3).

**DESIGN**

- (Q) 4 FEET BEHIND GUARDRAIL SHALL BE CLEAR OF OBSTRUCTIONS FOR DEFLECTION.
- (R) REFER TO SAFETY PLAN STANDARDS FOR HOW TO DETERMINE THE BEGINNING AND END.

**PAYMENT**

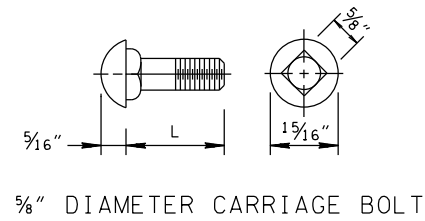
- (S) PAYMENT FOR GUARDRAIL WILL BE UNDER ITEM:
  - 705-06.01 W BEAM GUARDRAIL (TYPE 2) (MASH TL-3) PER LF
- (T) PAYMENT FOR SPECIAL CONNECTIONS AND GUARDRAIL SECTIONS REQUIRED FOR END TREATMENTS WILL BE AS NOTED ON THOSE DRAWINGS.
- (U) FOR W-GR BEAM INSTALLATION, LOCATION, AND DEFLECTION NOTES SEE S-PL-6.

SHEET NOT TO SCALE

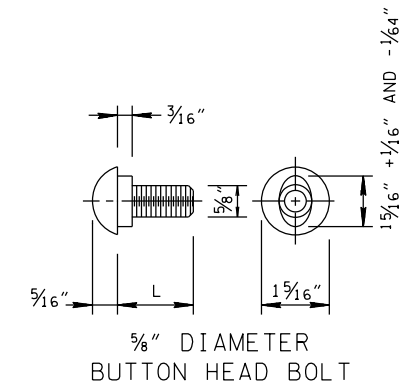
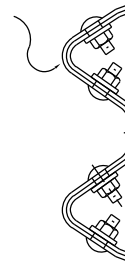
□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION

W-BEAM  
GUARDRAIL



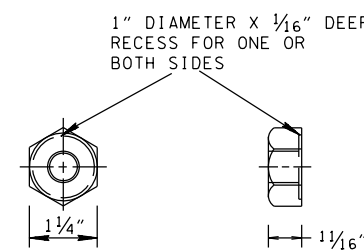
5/8" DIA. x 1 1/4" LENGTH,  
BUTTON HEAD BOLT WITH  
5/8" RECESS NUT OR  
HEX NUT AND 1 ROUND WASHER  
PER BOLT (TYPICAL).



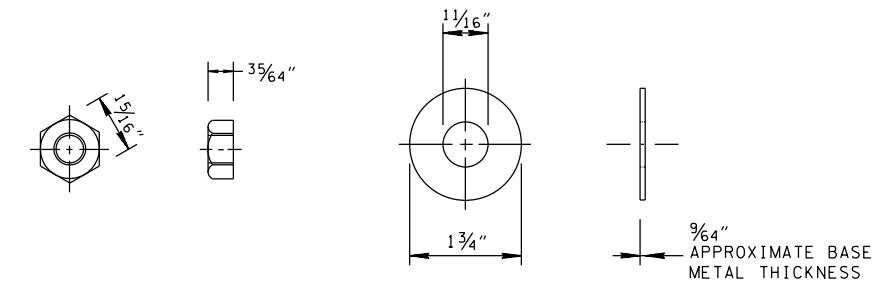
CARRIAGE BOLTS		
L	THREAD LENGTH	INTENDED USE
1 1/2"	FULL LENGTH THREAD	THIS BOLT IS A SPLICE BOLT FOR THE CHANNEL RUB RAIL ELEMENTS.
3"	1 1/2" MINIMUM THREAD LENGTH	THIS BOLT IS FOR FASTENING CHANNEL RUB RAIL ELEMENTS TO STEEL POST.
11"	1 3/4" MINIMUM THREAD LENGTH	THIS BOLT IS FOR FASTENING CHANNEL RUB RAIL ELEMENTS TO WOOD POST.
14"	1 3/4" MINIMUM THREAD LENGTH	THIS BOLT IS FOR FASTENING RUB RAIL ELEMENTS TO WOOD POST WHEN USED FOR MEDIAN DIVIDERS.
SPECIFICATIONS		
(S1) BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307 AND NUTS TO THE REQUIREMENTS OF ASTM A563M, GRADE "A" OR BETTER, AND BE GALVANIZED IN ACCORDANCE WITH ASTM A153. (S2) DIMENSIONAL TOLERANCES NOT SHOWN OR IMPLIED ARE INTENDED TO BE THOSE CONSISTENT WITH THE PROPER FUNCTIONING OF THE PART, INCLUDING ITS APPEARANCE, AND ACCEPTED MANUFACTURING PRACTICES.		

BUTTON HEAD BOLTS		
L	THREAD LENGTH	INTENDED USE
1 1/4"	FULL LENGTH THREAD	THIS BOLT IS FOR FASTENING "W" BEAM RAIL ELEMENTS AT JOINTS.
10"	1 3/4" MINIMUM THREAD LENGTH	THIS BOLT IS FOR FASTENING "W" BEAM RAIL ELEMENTS TO METAL POST WITH WOOD BLOCK-OUTS.
18"	2 1/2" MINIMUM THREAD LENGTH	THIS BOLT IS FOR FASTENING "W" BEAM RAIL ELEMENTS TO WOOD POST WITH WOOD BLOCK-OUTS.
25"	2" MINIMUM THREAD LENGTH	THIS BOLT IS FOR FASTENING "W" BEAM RAIL ELEMENTS TO WOOD POST WITH WOOD BLOCK-OUTS WHEN USED FOR MEDIAN DIVIDERS.

GENERAL NOTES	
(A)	BOLTS FOR CONNECTING RAIL TO POST THROUGH BLOCKOUT SHALL BE 5/8" DIAMETER X 10" (STEEL POST) OR 5/8" DIAMETER BY 18" (WOOD POST) BUTTON HEAD WITH ROUND STEEL WASHER. A 5/8" DIAMETER RECESSED BOLT (WITHOUT WASHER) MAY BE SUBSTITUTED FOR THE 5/8" DIAMETER BOLT (FOR BOTH WOOD AND STEEL POSTS) PER AASHTO SPECIFICATION M-180.
(B)	BOLTS SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND NO MORE THAN 3/4" BEYOND IT.



5/8" DIAMETER RECESS NUT



5/8" DIAMETER HEX NUT AND STEEL WASHER  
(ALTERNATE TO RECESS NUT)

THIS WASHER IS TO BE USED UNDER ALL BOLT HEADS AND NUTS SUBJECT TO TURNING WHEN TORQUED. ROUND WASHERS SHALL BE STEEL, GALVANIZED IN ACCORDANCE WITH AASHTO M232 SPECIFICATION.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

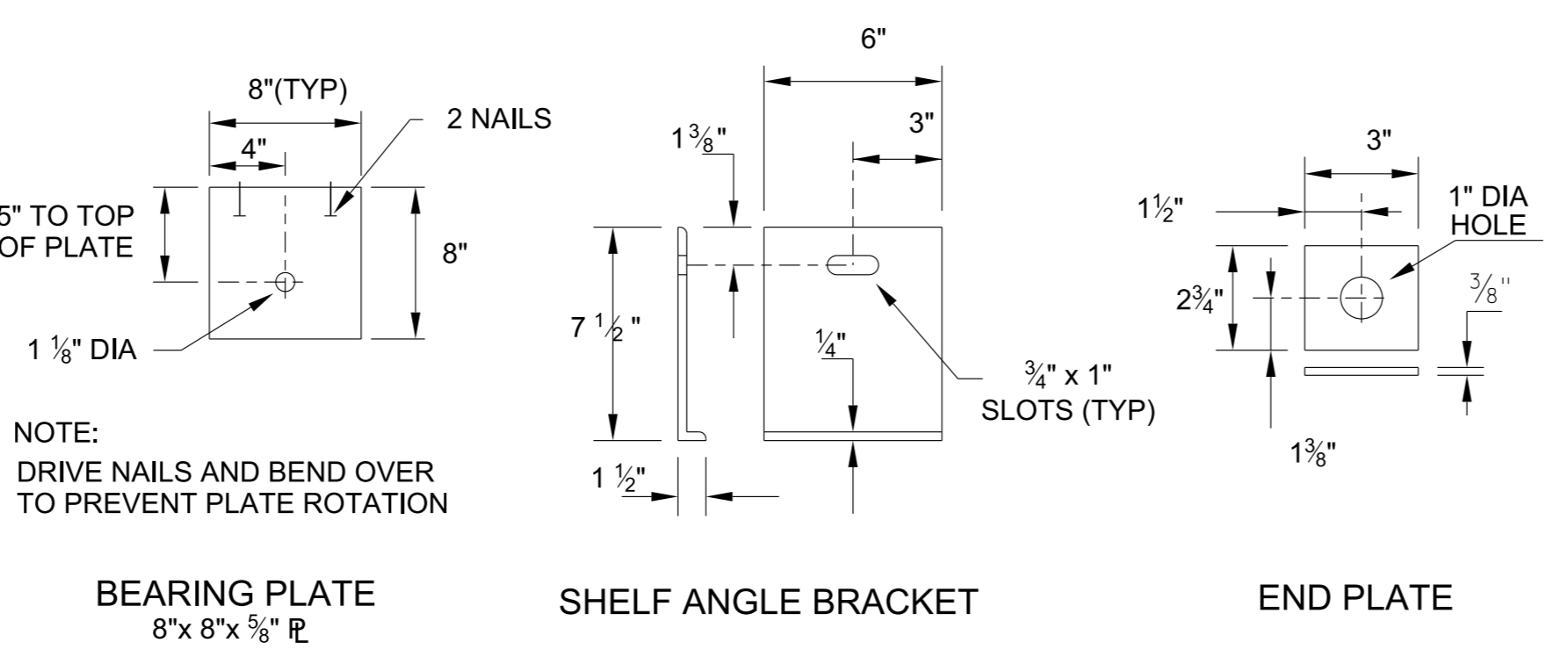
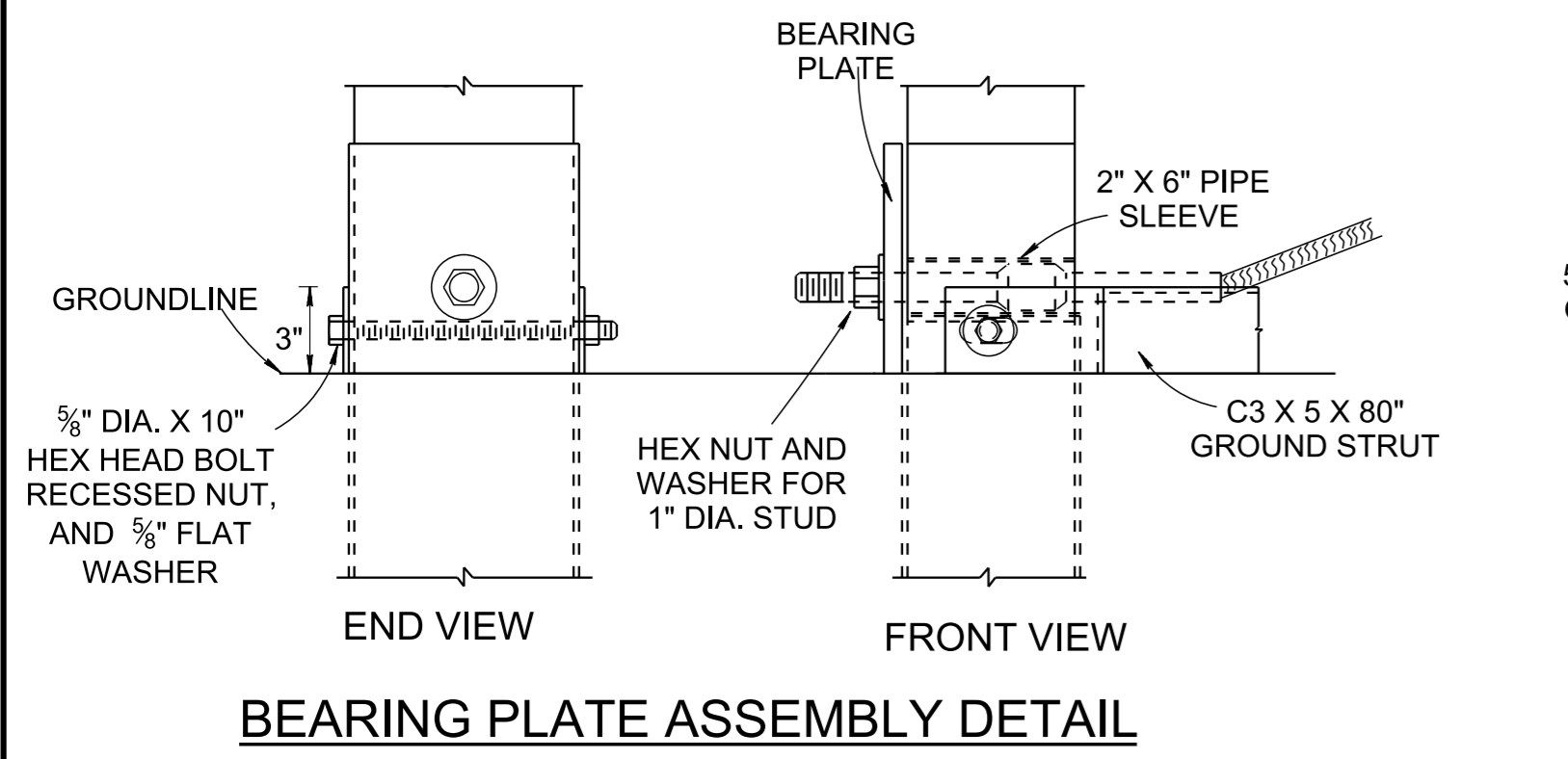
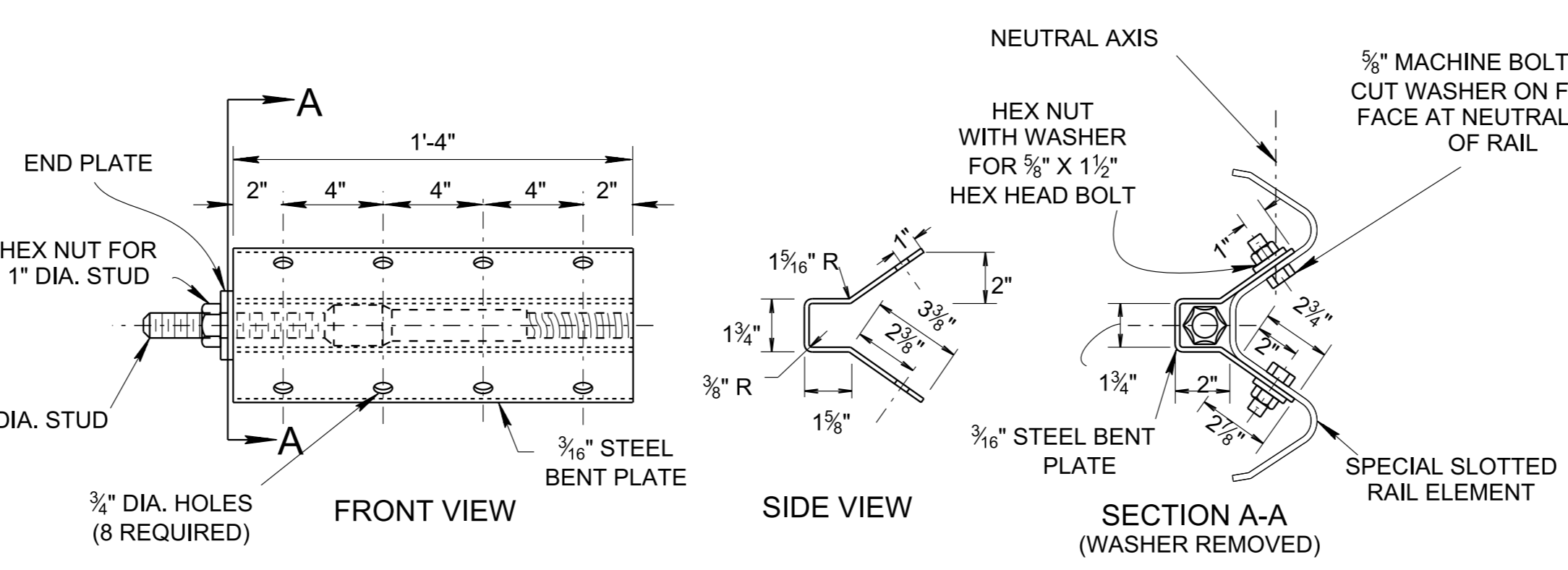
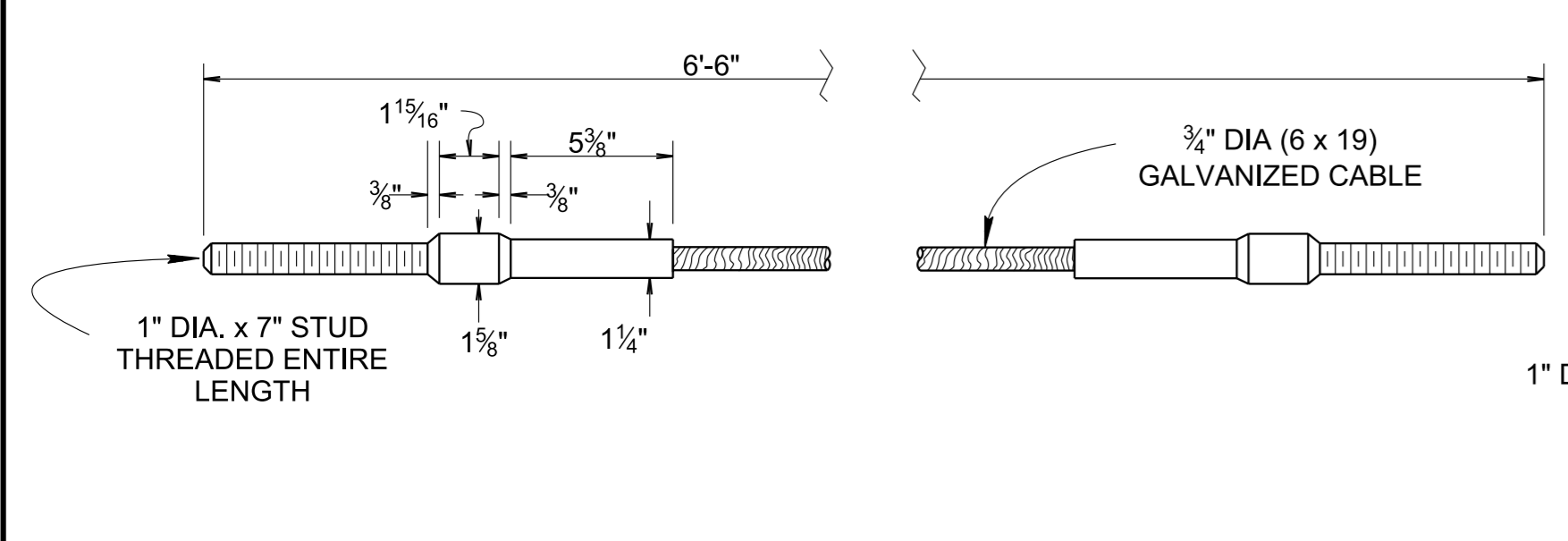
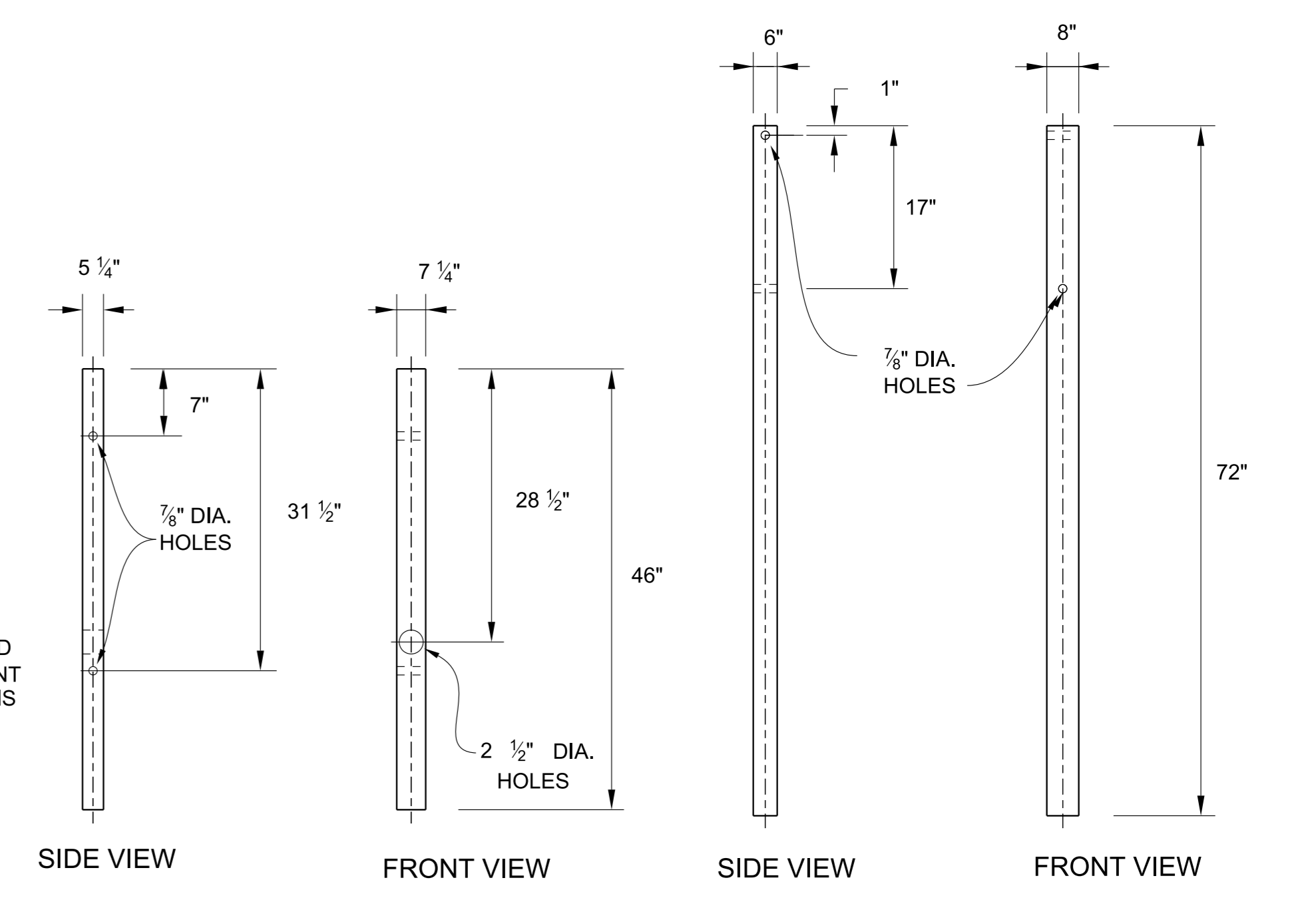
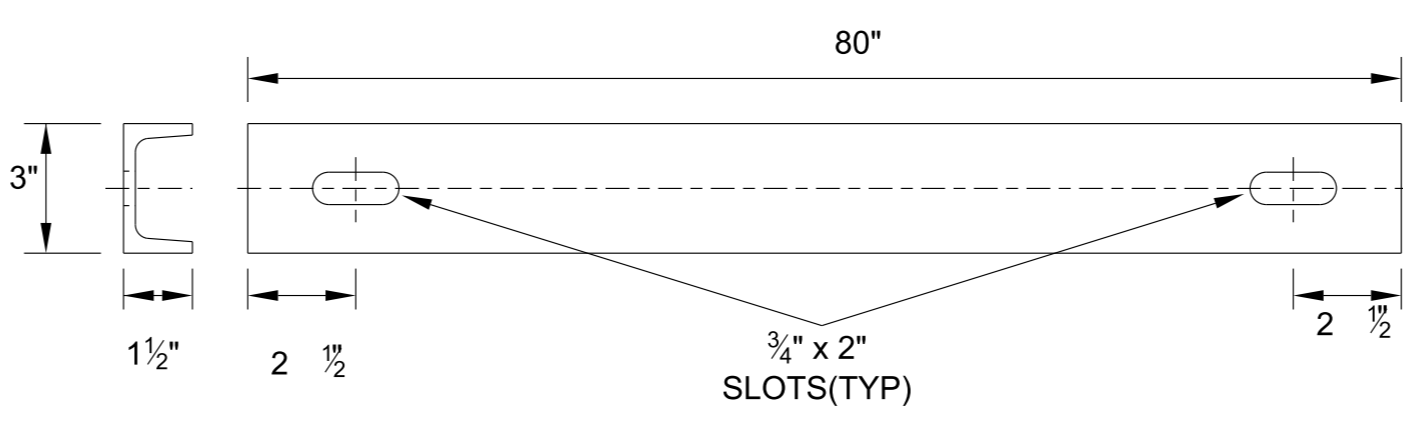
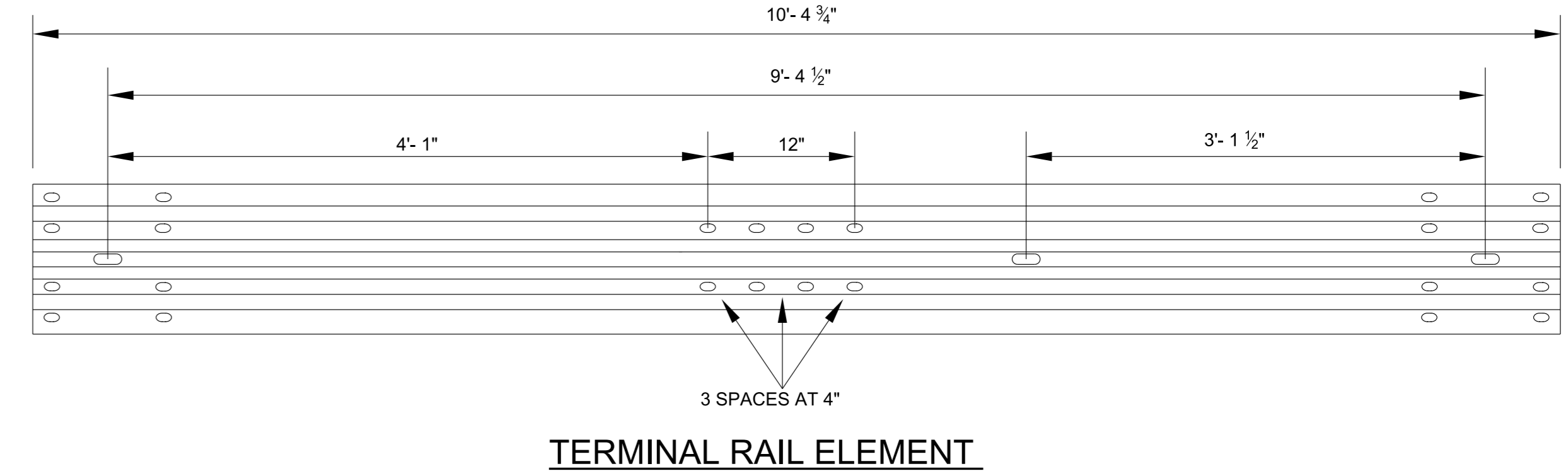
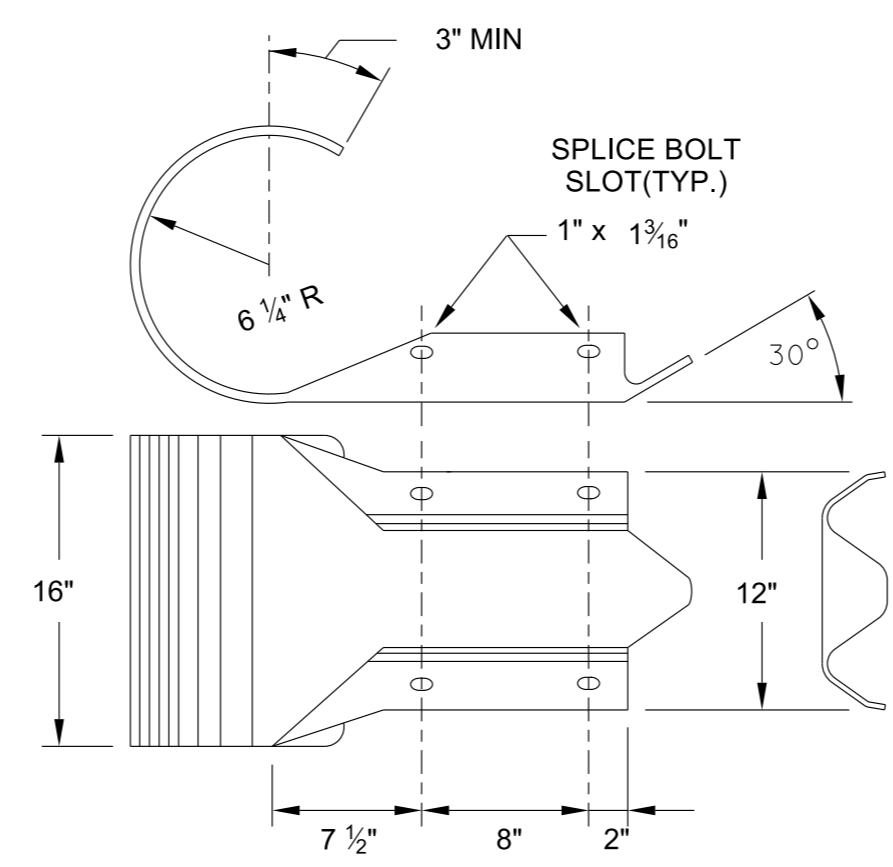
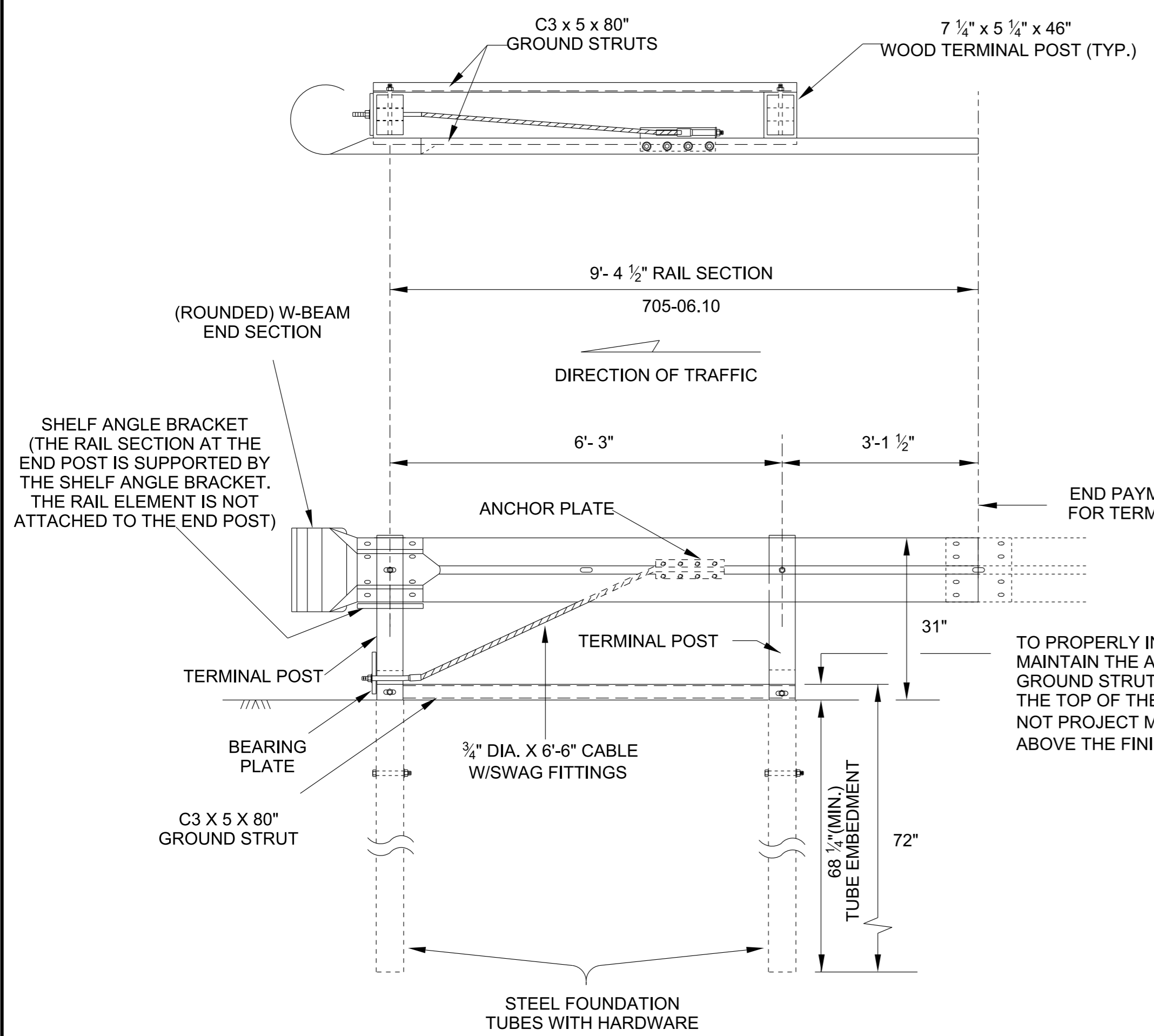
W-BEAM BARRIER  
FASTENING  
HARDWARE

5-12-16 S-GR31-1A



14-NOV-2017 10:43 \\AG03SDCWF00008.net.ads.state.in.us\1\3\SHARED\StandDraw\DESIGN STANDARDS\Design CADD Standards & Downloads\IB 17-14\ASGRA3-20170705.dgn

- REV. 3-28-17: CHANGED PAY ITEM NUMBER.
- REV. 7-5-17: REWORDED NOTE ON STRUT REQUIREMENTS IN THE DOWNSTREAM ANCHOR TERMINAL VIEW.
- REV. 5-1-15: REVISED NO.1 & 2 BREAK WAY POSTS WITH 5'-0" TUBE SLEEVE.
- REV. 5-27-16: REMOVED TYPE 21 AND IN-LINE FROM TITLE. UPDATED POST DETAIL, UPDATED STRUT DETAIL, ADDED RAIL DETAIL, AND UPDATED NOTES.



- GENERAL NOTES**
- (A) TYPE 13 GUARDRAIL TERMINAL SHALL ONLY BE INSTALLED AT TRAILING ENDS (DOWNSTREAM) WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC. SEE S-CZ-1.
  - (B) ALL HOLES IN WOOD POSTS ARE TO BE DRILLED BEFORE PRESERVATIVE TREATMENT IS APPLIED.
  - (C) ALL CUTTING, DRILLING, AND WELDING OF STEEL COMPONENTS SHALL BE DONE BEFORE GALVANIZING.
  - (D) THE FINISHED CABLE ASSEMBLY WILL NOT BE ACCEPTABLE UNLESS IT IS IN TENSION WITH NO SAG.
  - (E) OTHER ANCHOR CABLE ASSEMBLIES PROVIDING A MINIMUM BREAKING STRENGTH OF 40,000 POUNDS PER SQUARE INCH WILL BE ACCEPTABLE.
  - (F) TO BE PAID UNDER ITEM  
705-06.10 GR TERMINAL TRAILING END (TYPE 13) MASH TL3 PER EACH. (SEE S-PL-2)
  - (G) ALL HARDWARE SHALL CONFORM TO ASTM A307 UNLESS OTHERWISE SHOWN.
  - (H) DESIGN BASED ON AASHTO MASH TL-3, TTI REPORT 9-1002-6.

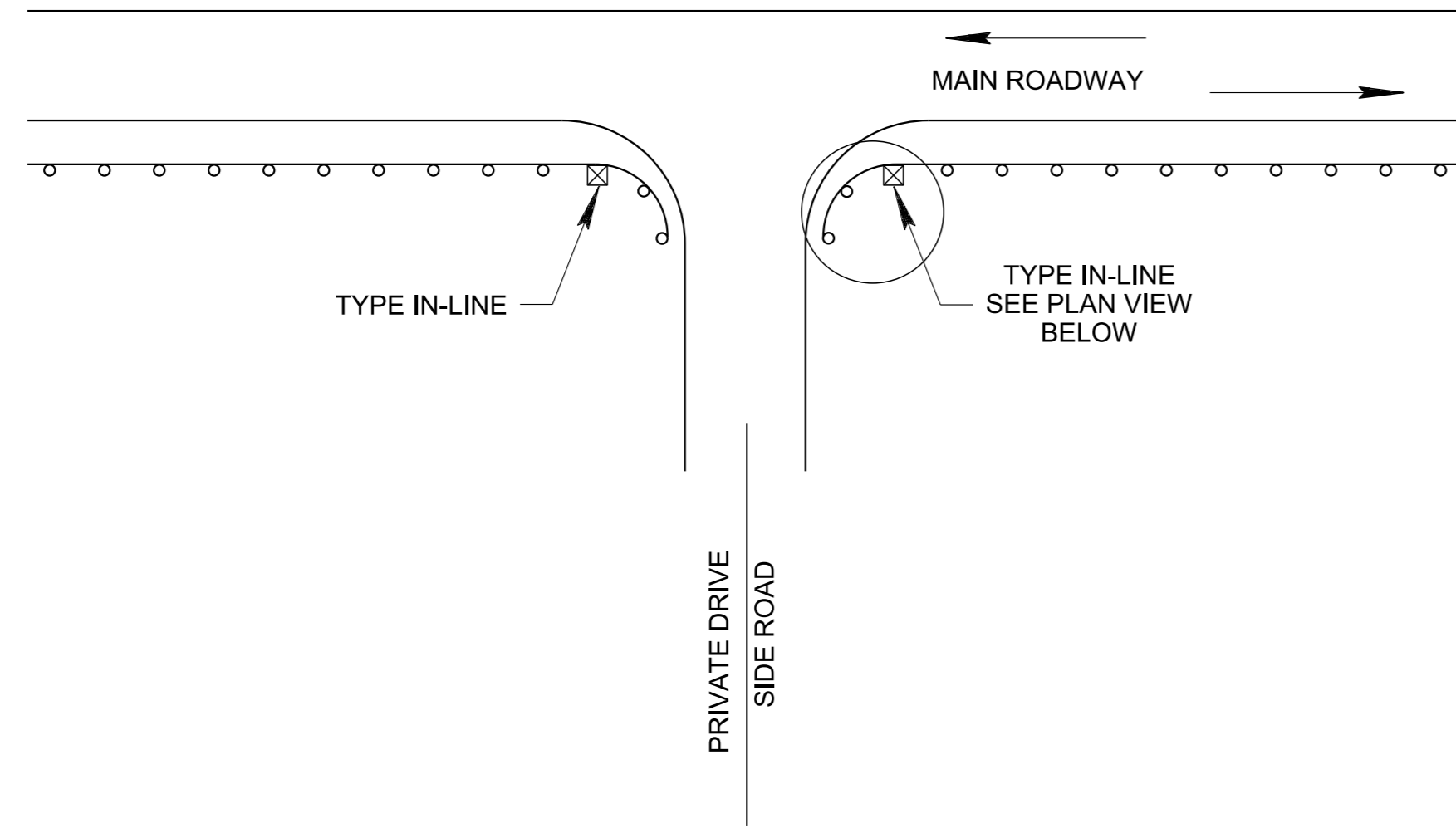
MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

**STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION**

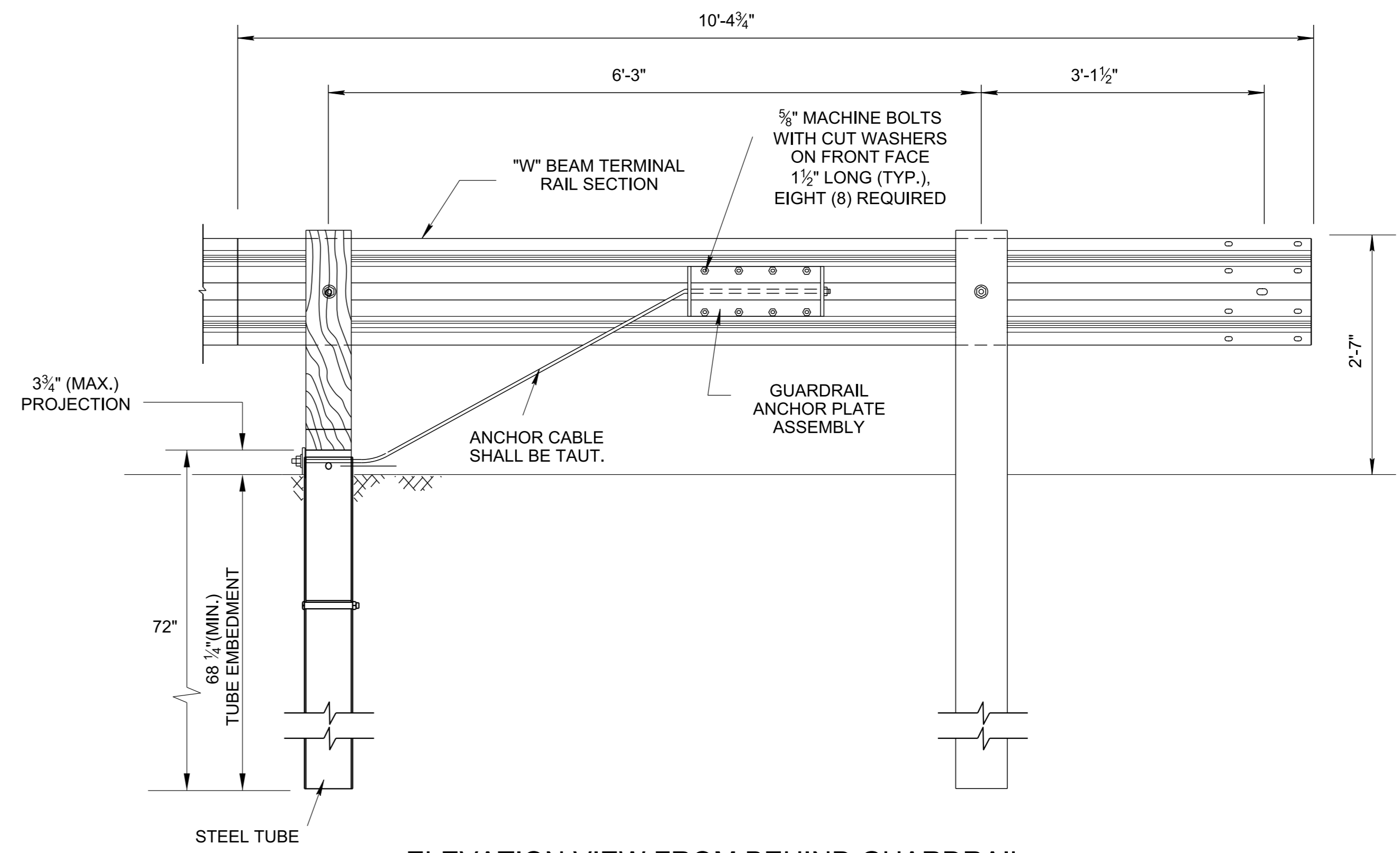
**TYPE 13  
GUARDRAIL ANCHOR**

7-11-13 S-GRA-3

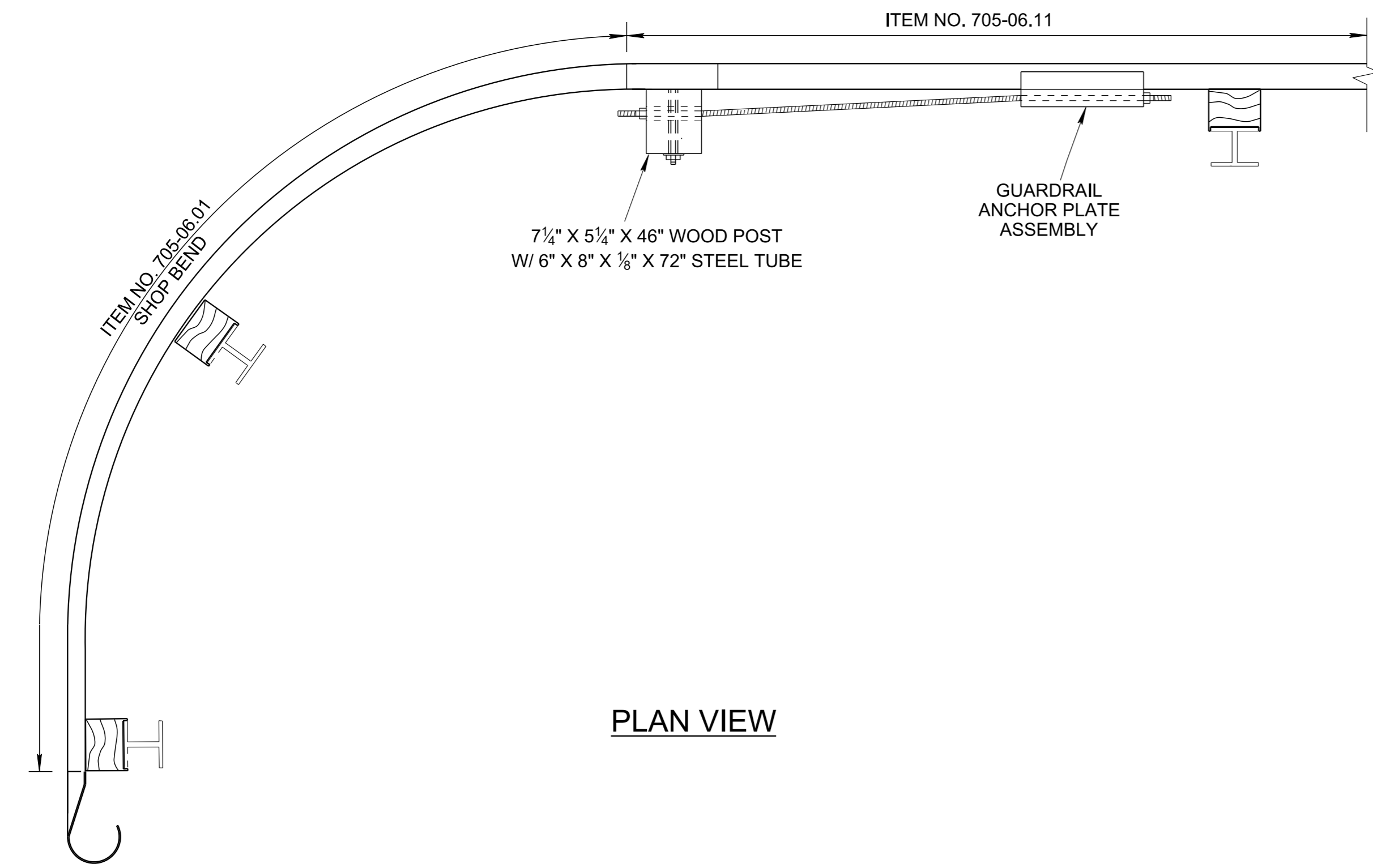
- REV. 5-27-16: REVISED POST SIZE IN PLAN VIEW. ADDED DIMENSIONS, REVISED DETAIL, REVISED NOTES.
- REV. 3-28-17: CHANGED PAY ITEM NUMBER.
- REV. 7-5-17: COMBINED THE TWO PLAN VIEWS. ADDED A DIMENSION TO THE ELEVATION VIEW.



**GUARDRAIL TERMINAL ANCHOR (TYPE IN-LINE) APPLICATION**



**ELEVATION VIEW FROM BEHIND GUARDRAIL**  
(SEE S-GRA-3 FOR HARDWARE DETAILS)



**PLAN VIEW**

ROUNDED END ELEMENT  
(ITEM NO. 706-10.26)

**NOTE TO DESIGNER**  
DO NOT USE ON NATIONAL HIGHWAY SYSTEM (NHS), USE S-PL-2 ON NHS  
DO NOT USE WITHOUT ALSO REFERENCING S-GRA-3 .

**GENERAL NOTES**

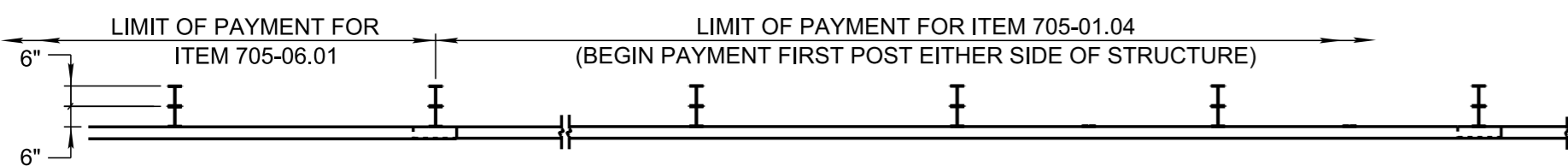
(A) THIS ANCHORAGE MAY ONLY BE USED ON THE TRAILING END OF A BARRIER WHICH IS NOT EXPOSED TO DIRECT VEHICULAR IMPACT OR IS OUTSIDE THE CLEAR ZONE (ONLY DIVIDED HIGHWAYS OR ROADS WITH ONE WAY TRAFFIC) USE S-PL-1 TO DETERMINE LENGTH OF NEED.

(B) IN-LINE GUARDRAIL TERMINAL TO BE PAID FOR UNDER ITEM NUMBER: PAY ITEM NO. 705-06.11 GR TERMINAL (IN-INLINE) MASH TL3 PER EACH COST TO INCLUDE WOOD POST, STEEL TUBE, ANCHOR CABLE, AND GUARDRAIL ANCHOR PLATE ASSEMBLY.

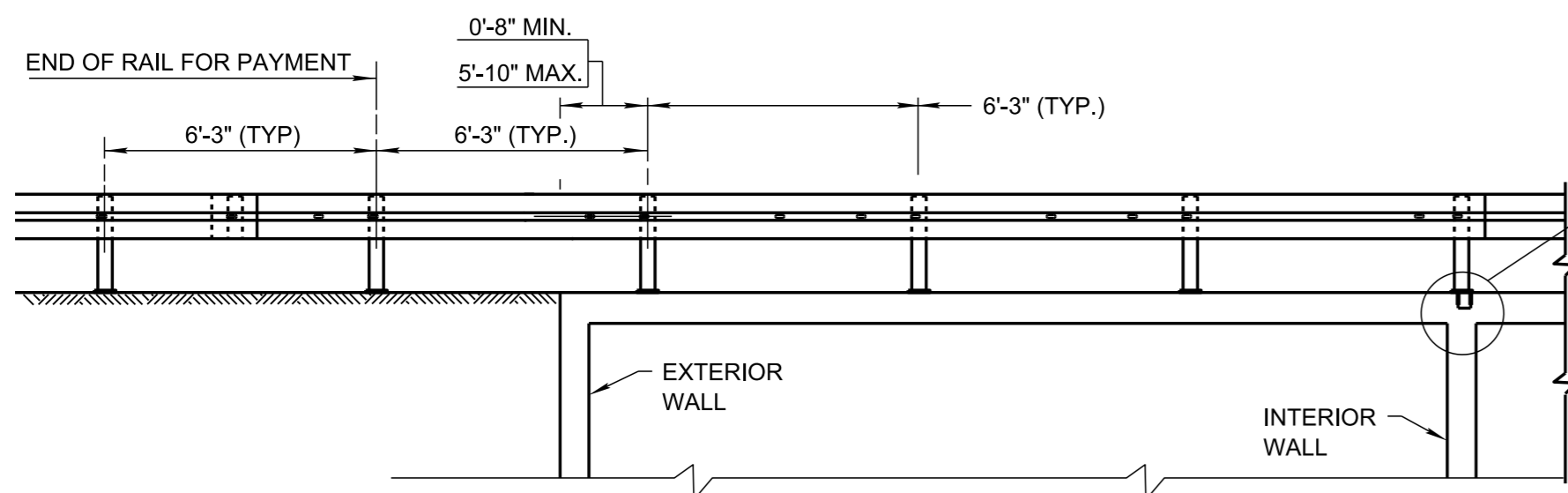
□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

**STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION**

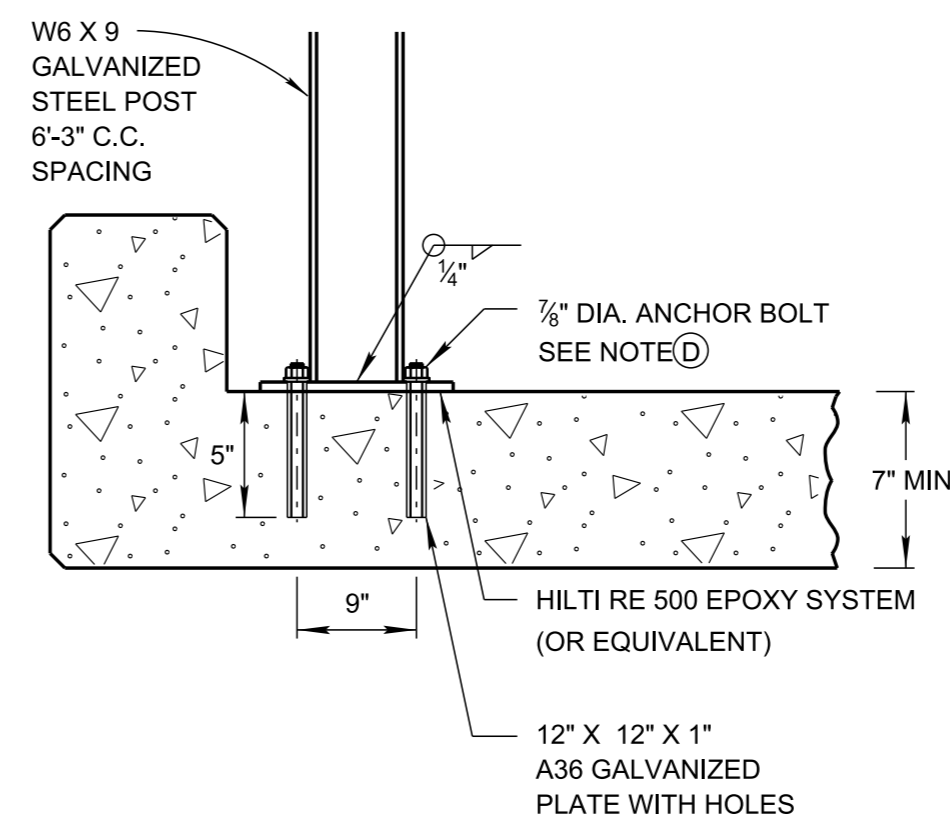
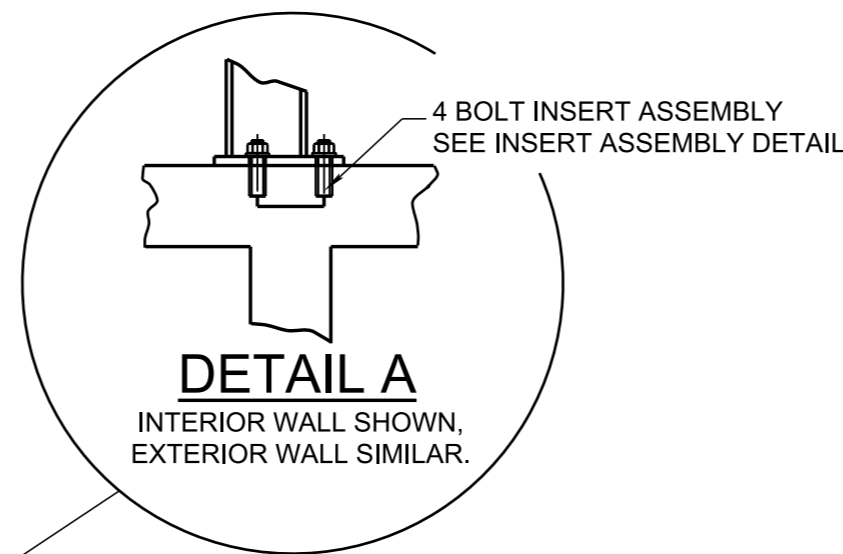
**IN-LINE  
GUARDRAIL  
ANCHOR**



PLAN

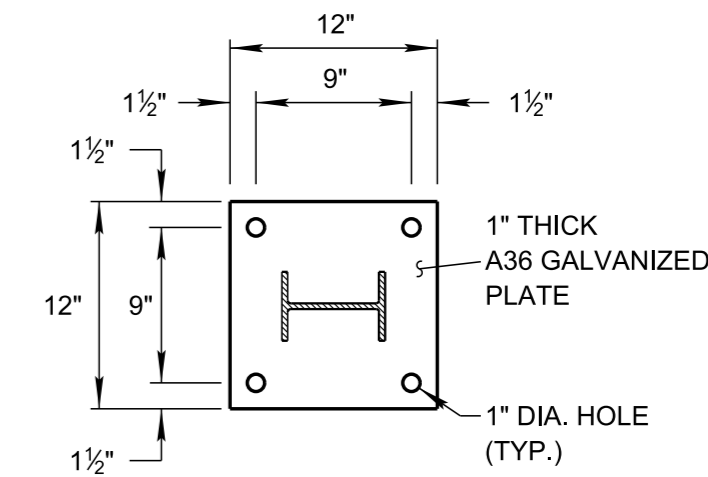


ELEVATION VIEW

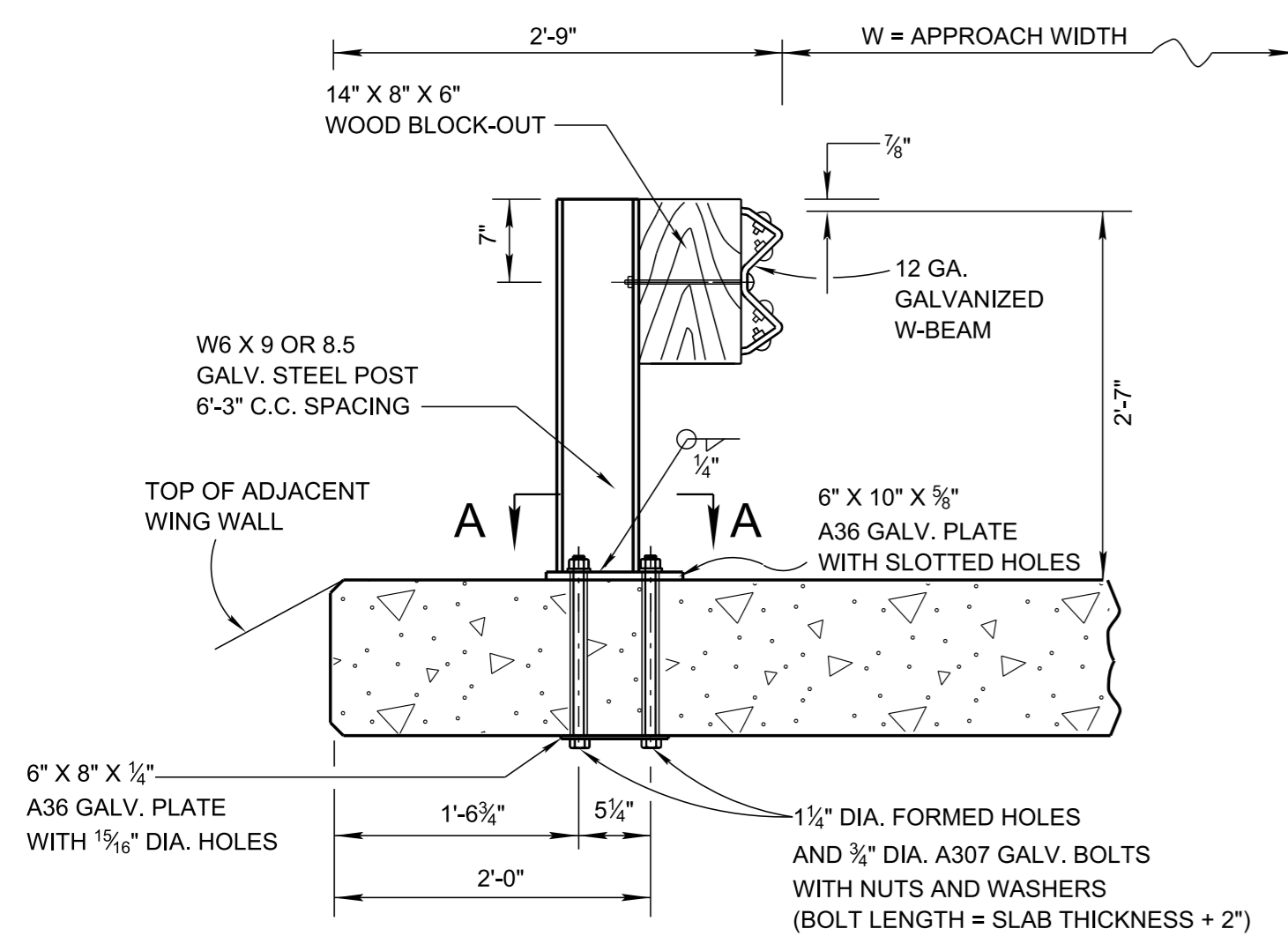


ALTERNATE DETAIL A  
ALTERNATE POST ATTACHMENT  
USING ANCHOR BOLTS  
SEE BASEPLATE DETAILS

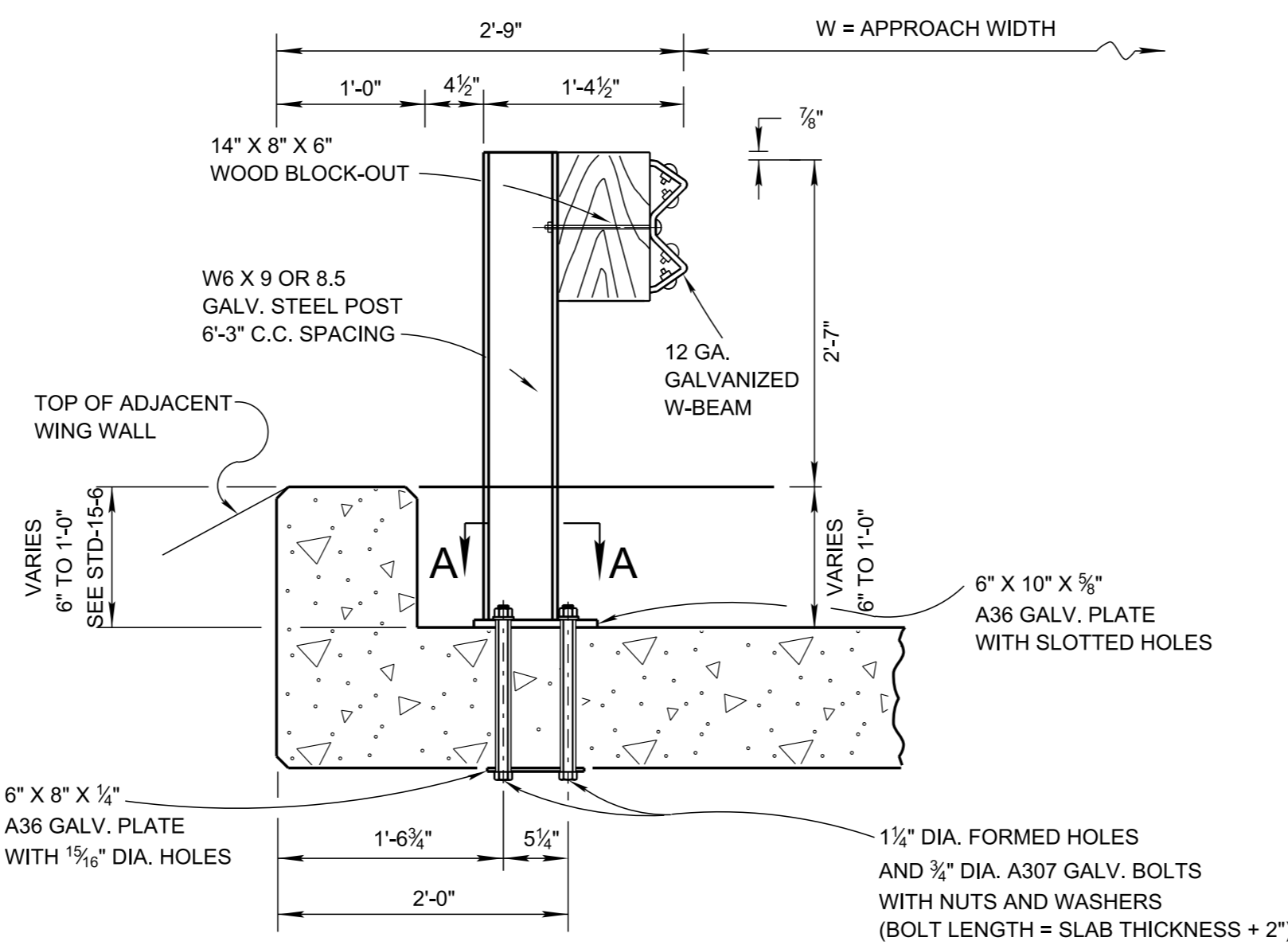
INSERT ASSEMBLY  
FOR 3/4" DIA. X 4" HEX HEAD A307 BOLTS



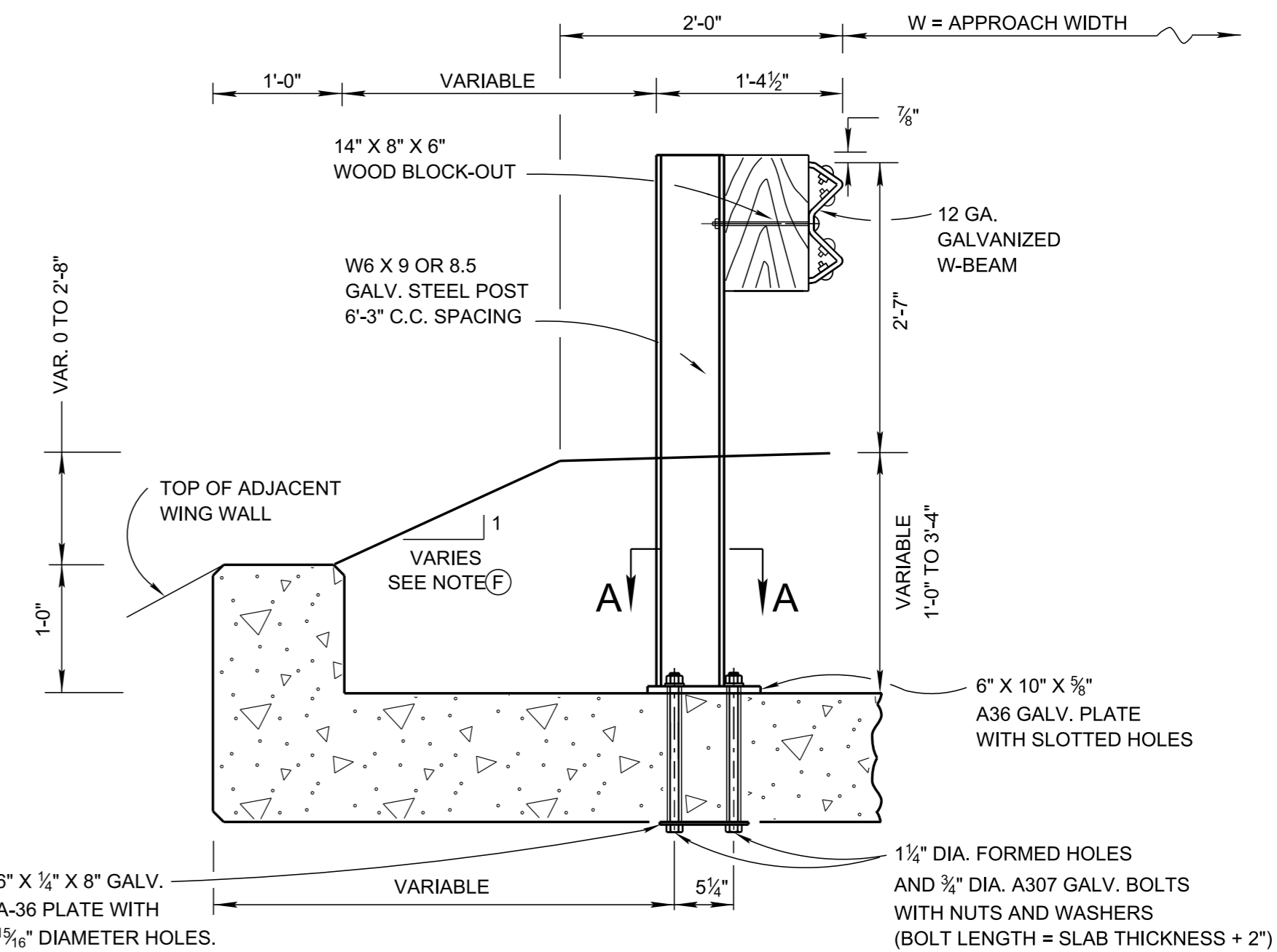
BASEPLATE DETAILS



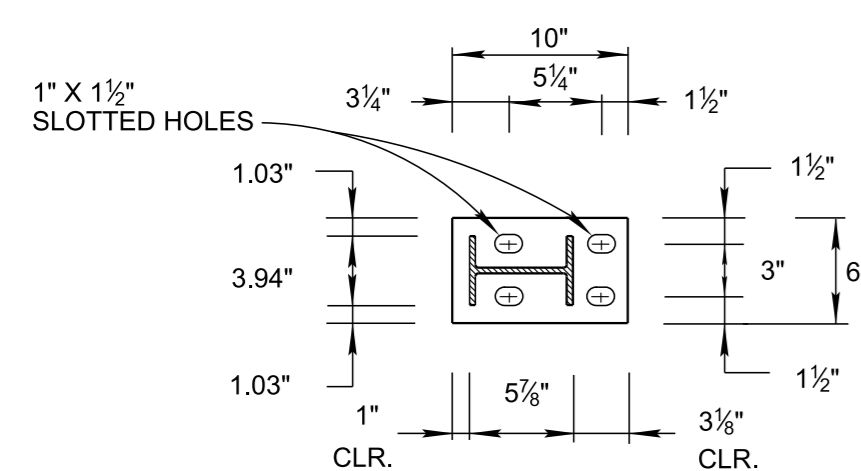
DETAIL FOR CONCRETE DECK  
USED AS A RIDING SURFACE



DETAIL FOR CONCRETE DECK  
WITH 6" TO 1'-0" OF ROADWAY FILL COVER



DETAIL FOR CONCRETE DECK  
WITH 1'-0" TO 3'-4" OF ROADWAY FILL COVER



SECTION A-A

DESIGN NOTES

- 1 WHEN DEPTH OF FILL AT FACE OF GUARDRAIL EXCEEDS 3'-4", USE ITEM NUMBER 705-06.01 AS SHOWN ON S-GR31-1.
- 2 DO NOT USE ON PRECAST CONCRETE STRUCTURE WITHOUT PRIOR APPROVAL FROM MANUFACTURERS.
- 3 THIS RAIL SYSTEM HAS BEEN TESTED AND PASSED BY THE CRITERIA SET FORTH BY AASHTO MASH TEST LEVEL 3, AS DOCUMENTED IN ROADSIDE SAFETY RESEARCH PROGRAM POOLED FUND STUDY NO. TPF-5(114) DATED NOV. 11, 2011.
- 4 ANY REINFORCING STEEL THAT INTERFERES WITH THE 1 1/4" DIAMETER FORMED HOLES SHALL BE MOVED HORIZONTALLY TO PROVIDE A 1" MINIMUM CLEARANCE TO THE HOLE.

GENERAL NOTES

- (A) IN ORDER TO EXPEDITE INSTALLATION, GUARDRAIL POST MAY BE FIELD CUT TO ADJUST THE LENGTH REQUIRED. ALL CUT SURFACES MUST RECEIVE GALVANIZE COATING.
- (B) FOR DIMENSIONS AND DETAILS NOT SHOWN SEE STANDARD STRUCTURES DRAWING NOS. STD-17-7 AND STD-17-8, AND STANDARD ROADWAY DRAWING S-GR31-1.
- (C) TO BE PAID FOR UNDER ITEM NO: 705-01.04 METAL BEAM GUARD FENCE PER LF.
- (D) ANCHOR BOLTS TO BE 3/8" DIA., ASTM A193, GRADE B7. NUTS AND WASHERS TO BE GALVANIZED.
- (E) INSERT ASSEMBLY TO BE USED FOR CONNECTION OF POSTS OVER WALLS ONLY AND MAY NOT BE USED AS A SUBSTITUTE FOR PLATE ASSEMBLY ELSEWHERE.
- (F) SLOPE TO MATCH ADJOINING ROADWAY SIDE SLOPE.

- REV. 5-25-16: CORRECTED WELD DETAIL.
- REV. 7-5-17: CORRECTED STD. DWG. NUMBERS ON GEN. NOTE (B). ADDED GENERAL NOTES (D), (E) AND (F). CHANGED PAY ITEM NUMBER IN DESIGN NOTE (1).

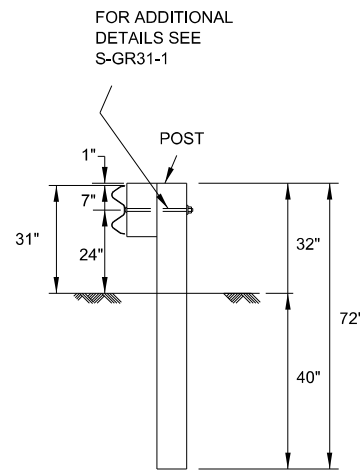
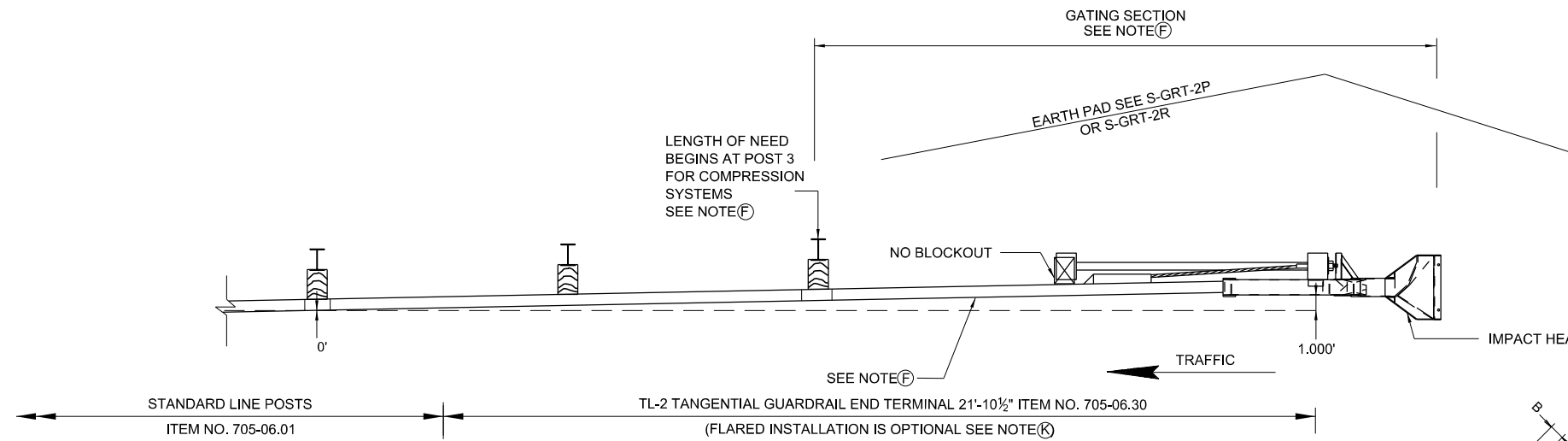
MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION

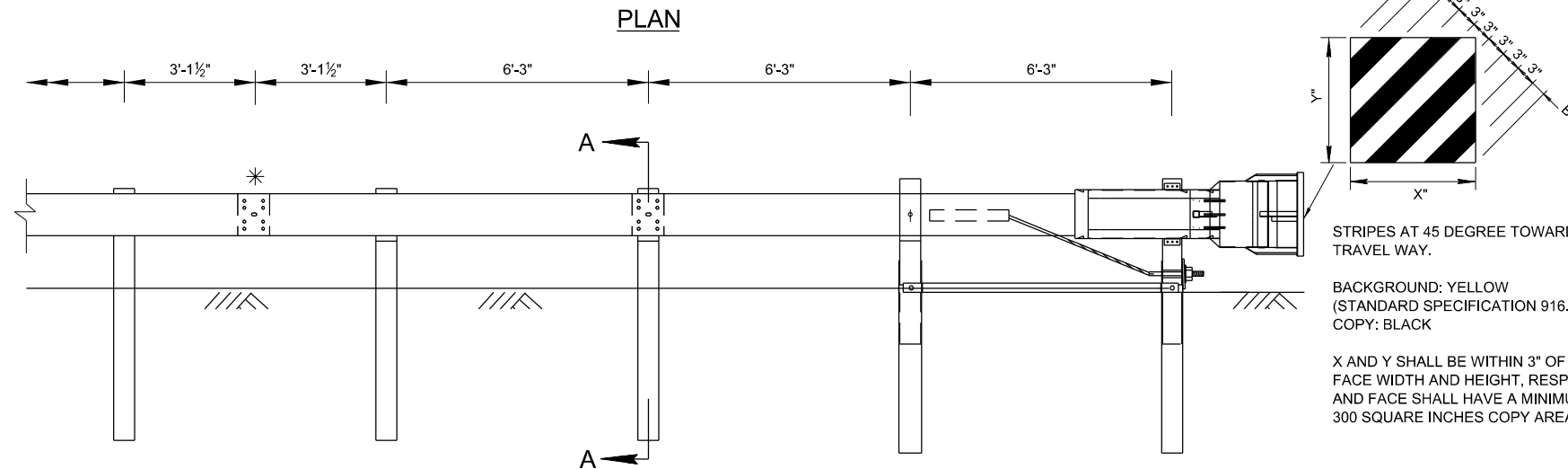
SPECIAL CASE:  
GUARDRAIL  
ATTACHMENT  
TO CONCRETE  
DECKS

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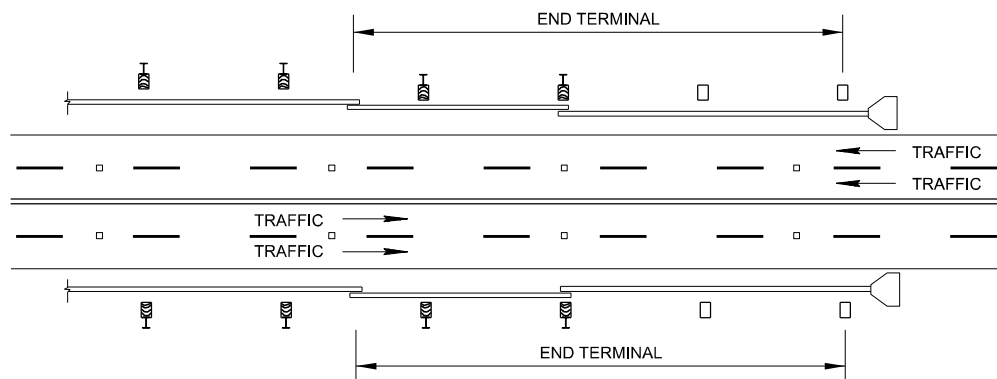




**SECTION A-A**  
(NOMINAL DIMENSIONS)



\* FOR MAINTENANCE AND REPAIR PROJECTS:  
IF ONLY THE TERMINAL IS TO BE REPLACED,  
USE S-GRS-4 TO TRANSITION BACK TO 27" HEIGHT.



**W-BEAM OVERLAPPING DETAIL**

**GENERAL NOTES**

- (A) ONLY MASH COMPLIANT TL-2 END TERMINALS ON THE TDOT QUALIFIED PRODUCTS LIST MAY BE INSTALLED. MANUFACTURER'S SHOP DRAWINGS SHALL BE REQUIRED BEFORE ANY TANGENTIAL END TERMINAL INSTALLATIONS CAN BEGIN. THE CONTRACTOR SHALL HAVE ONE COMPLETE SET OF SHOP DRAWINGS ON SITE DURING INSTALLATION OR REPAIR OF ANY TANGENTIAL GUARDRAIL TERMINAL ANCHOR. THE CONTRACTOR SHALL ALSO PROVIDE THE CONSTRUCTION OR MAINTENANCE SUPERVISOR WITH ONE COMPLETE SET OF SHOP DRAWINGS INCLUDING TDOT QUALIFIED PRODUCTS LIST EVALUATION NUMBER.
- (B) FOR THE TYPE 21 GUARDRAIL TERMINAL TO FUNCTION AS IT WAS CRASH TESTED UNDER MASH TL-2, THE EARTH PAD MUST BE CONSTRUCTED PER STANDARD DRAWING S-GRT-2P OR S-GRT-2R.
- (C) THE END TERMINAL (INCLUDING ANCHOR) IS TO BE INSTALLED UNDER ITEM NUMBER 705-06.30 (GUARDRAIL TERMINAL TYPE21 MASH TL-2 PER EACH)
- (D) TERMINAL SYSTEM MUST BE CONSTRUCTED SO THAT THE FULL LENGTH OF THE TERMINAL SYSTEM GUARD RAILING IS IN STRAIGHT ALIGNMENT.
- (E) DIFFERENT TERMINAL SYSTEMS OR PARTS SHALL NOT BE COMBINED ON A RUN OF GUARDRAIL.
- (F) THE FIRST 12'-6" FROM IMPACT HEAD IS GATING FOR SKT-SP-MGS, DO NOT USE THIS SECTION IN LENGTH OF NEED. TENSION SYSTEMS PROVIDE REDIRECTIVE CAPACITY AT THE FIRST POST.
- (G) IF GUARDRAIL NEEDS TO BE EXTENDED, EXTEND GUARDRAIL IN INCREMENTS OF 12'-6".
- (H) IF WOOD POSTS ARE USED, ALL HOLES IN WOOD POSTS ARE TO BE DRILLED BEFORE PRESERVATIVE TREATMENT.
- (I) ALL CUTTING, DRILLING, AND WELDING OF STEEL COMPONENTS SHALL BE DONE BEFORE GALVANIZING.
- (J) THE FINISHED CABLE ASSEMBLY WILL NOT BE ACCEPTABLE UNLESS IT IS IN TENSION WITH NO SAG.
- (K) IF THE SHOULDER WIDTH IS LESS THAN 2'-0", END TERMINAL MUST BE FLARED. IF THE SHOULDER WIDTH IS GREATER THAN 2'-0", END TERMINAL MAY BE TANGENTIAL. IF FLARED IMPLEMENTATION IS IMPLEMENTED, USE 25:1 MAXIMUM FLARE RATE OR INSTALL END TERMINAL AS DIRECTED BY THE FIELD ENGINEER.
- (L) FOR RETROFIT PROJECTS, SEE S-GRT-2R.
- (M) FOR NEW CONSTRUCTION, INSTALL TERMINALS AT 31" HEIGHT. FOR RETROFIT PROJECTS, USE GUARDRAIL HEIGHT TRANSITION DETAIL, SEE S-GRS-4.

**NOTE TO INSTALLER**

SKT-SP-MGS WITH 21'- 10 1/2" INSTALLATION IS SHOWN, POST MATERIAL, SIZE, GUARDRAIL SPLICING LOCATION, TAPER RATE, OFFSET, GUARDRAIL HEIGHT, IMPACT HEAD DIMENSION, AND ALL OTHER MISCELLANEOUS HARDWARE MAY BE DIFFERENT. INSTALLATION SHALL FOLLOW THE MANUFACTURER'S SHOP DRAWINGS.

**NOTES TO DESIGNER**

THIS TERMINAL SHALL ONLY BE USED ON ROADWAYS WITH POSTED SPEED LIMITS OF 45 MPH OR LESS.  
DO NOT USE WITHOUT REFERENCING S-GRT-2P OR S-GRT-2R.

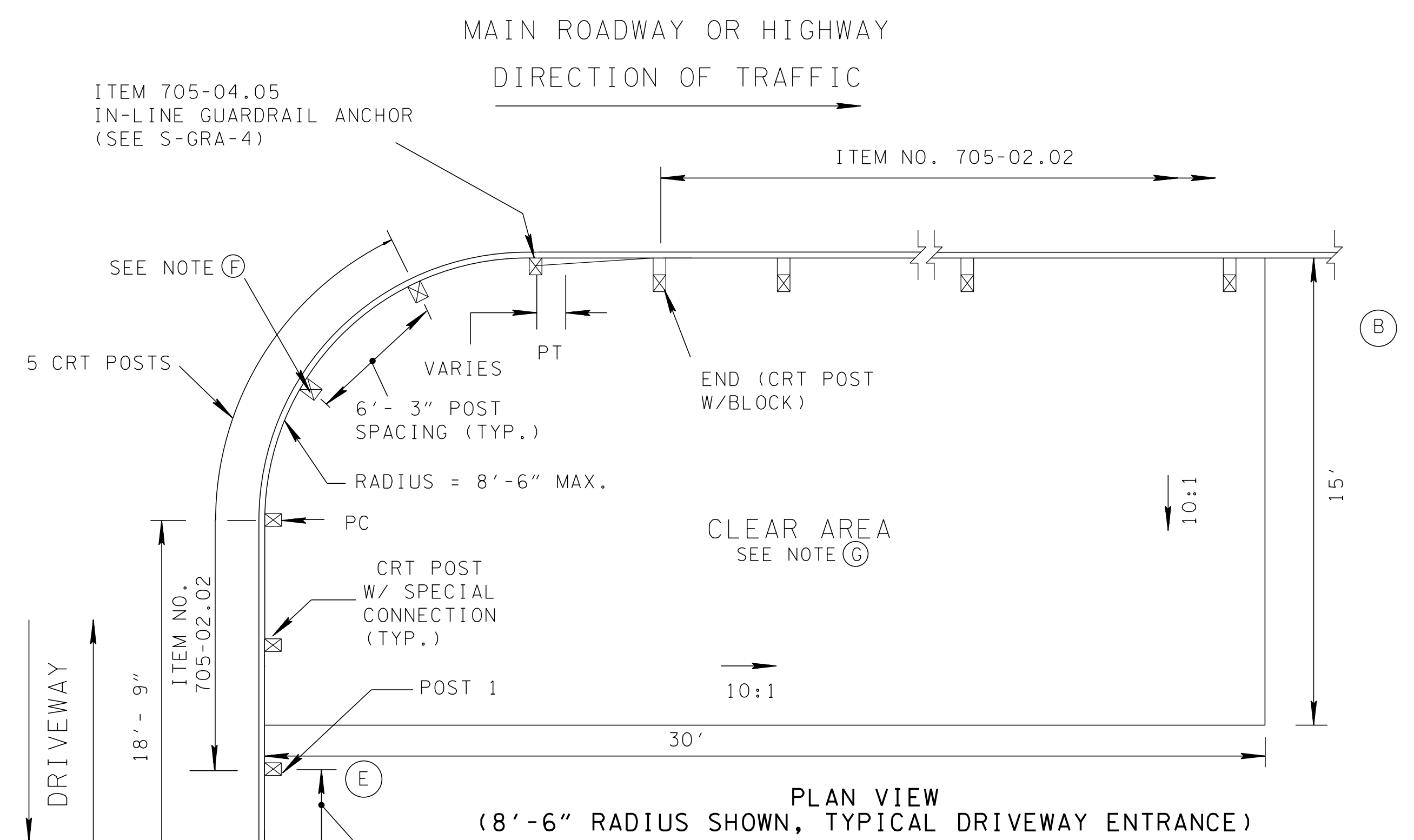
- REV. 11-3-14: MODIFIED PAY LENGTH FOR TYPE 38 END TERMINAL.
- REV. 4-4-16: THE PREVIOUSLY SHOWN SKT75 (SLOTTED FLARED GUARDRAIL TERMINAL) IS NO LONGER AVAILABLE FOR 31" INSTALLATION. REVISED TO SHOW TL-2 T-350 TERMINAL.
- REV. 10-10-16: UPDATED LIMIT OF PAYMENT.
- REV. 3-28-17: UPDATED NOTES TO INSTALLER, ADDED W-BEAM OVERLAPPING DETAIL, REORGANIZED SHEET, CHANGED PAY ITEM NUMBER, REPLACED "SKT 350" WITH "SKT-SP-M65" IN NOTE TO INSTALLER.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION

TYPE 21  
GUARDRAIL END  
TERMINAL

7-11-13 S-GRT-3



PLAN VIEW  
(8'-6" RADIUS SHOWN, TYPICAL DRIVEWAY ENTRANCE)

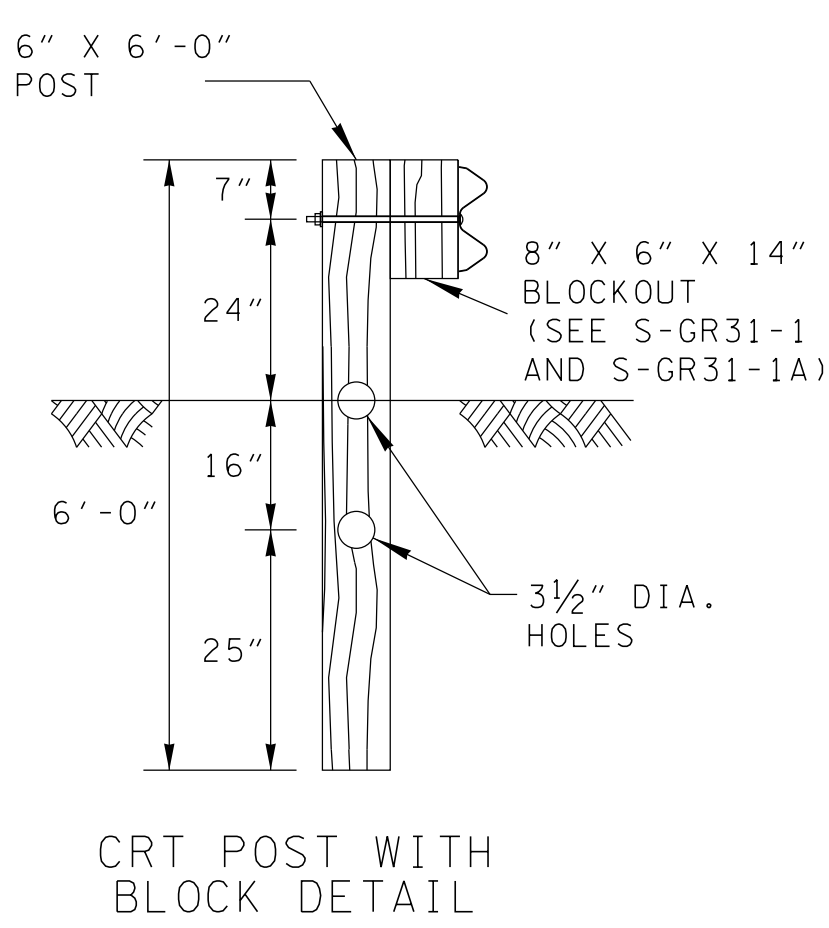
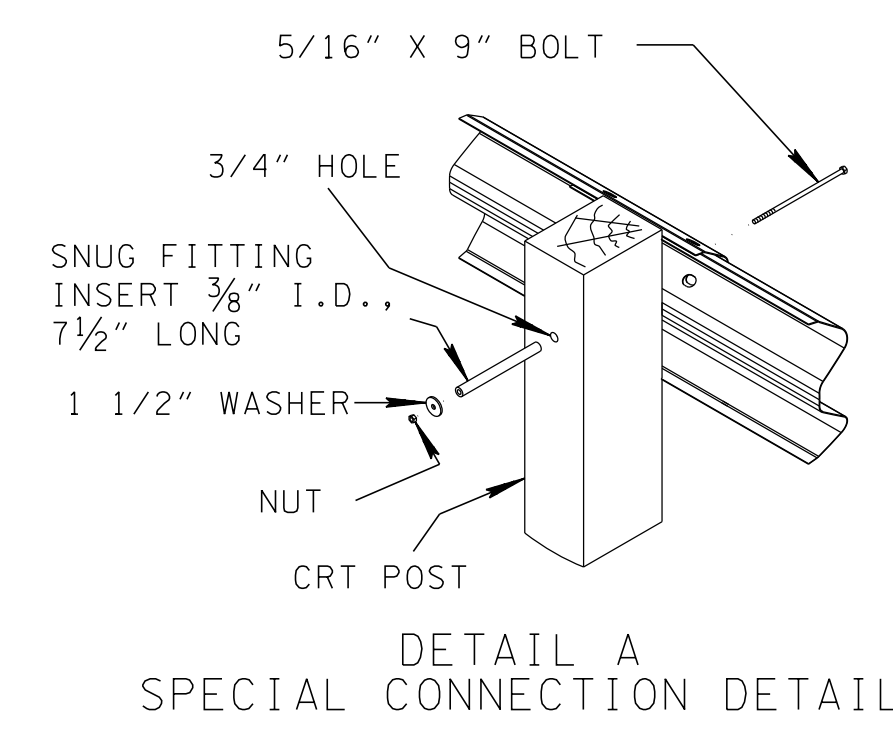
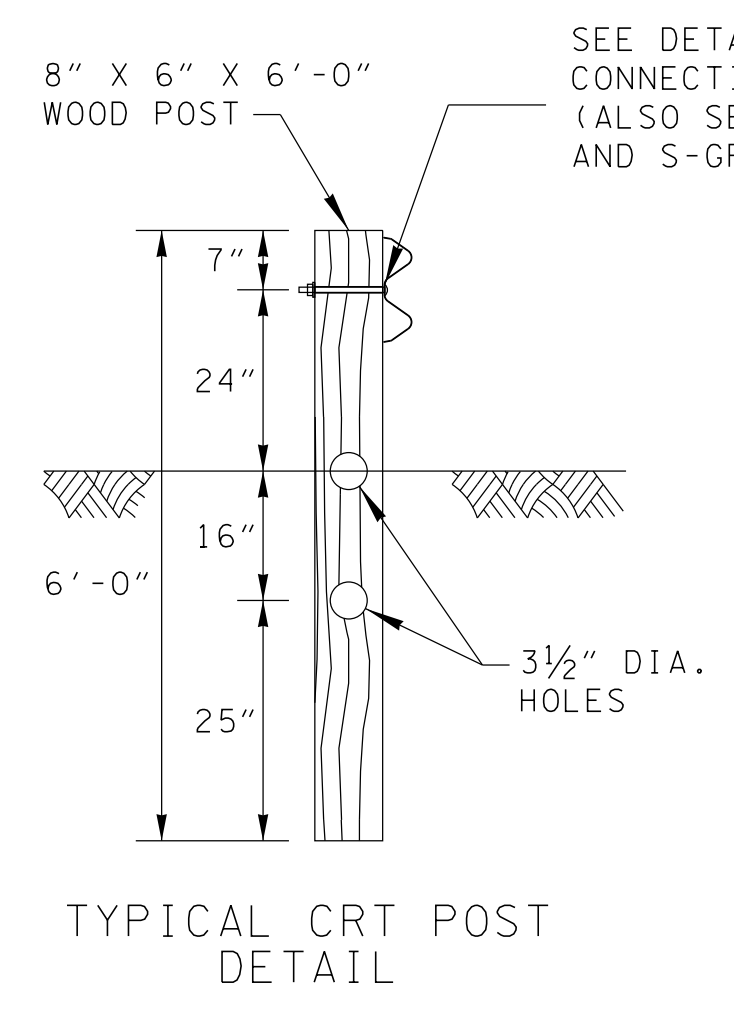
TABLE A  
POST AND CLEAR AREA REQUIREMENTS

GUARDRAIL RADIUS	NUMBER OF CRT POSTS	CLEAR AREA	
		L	W
F 8'-6"	5	30'	15'
17'-0"	6	30'	15'
25'-6"	8	40'	20'
35'-0"	11	50'	20'

TABLE B  
ESTIMATED QUANTITIES FROM BEGINNING POINT TO END

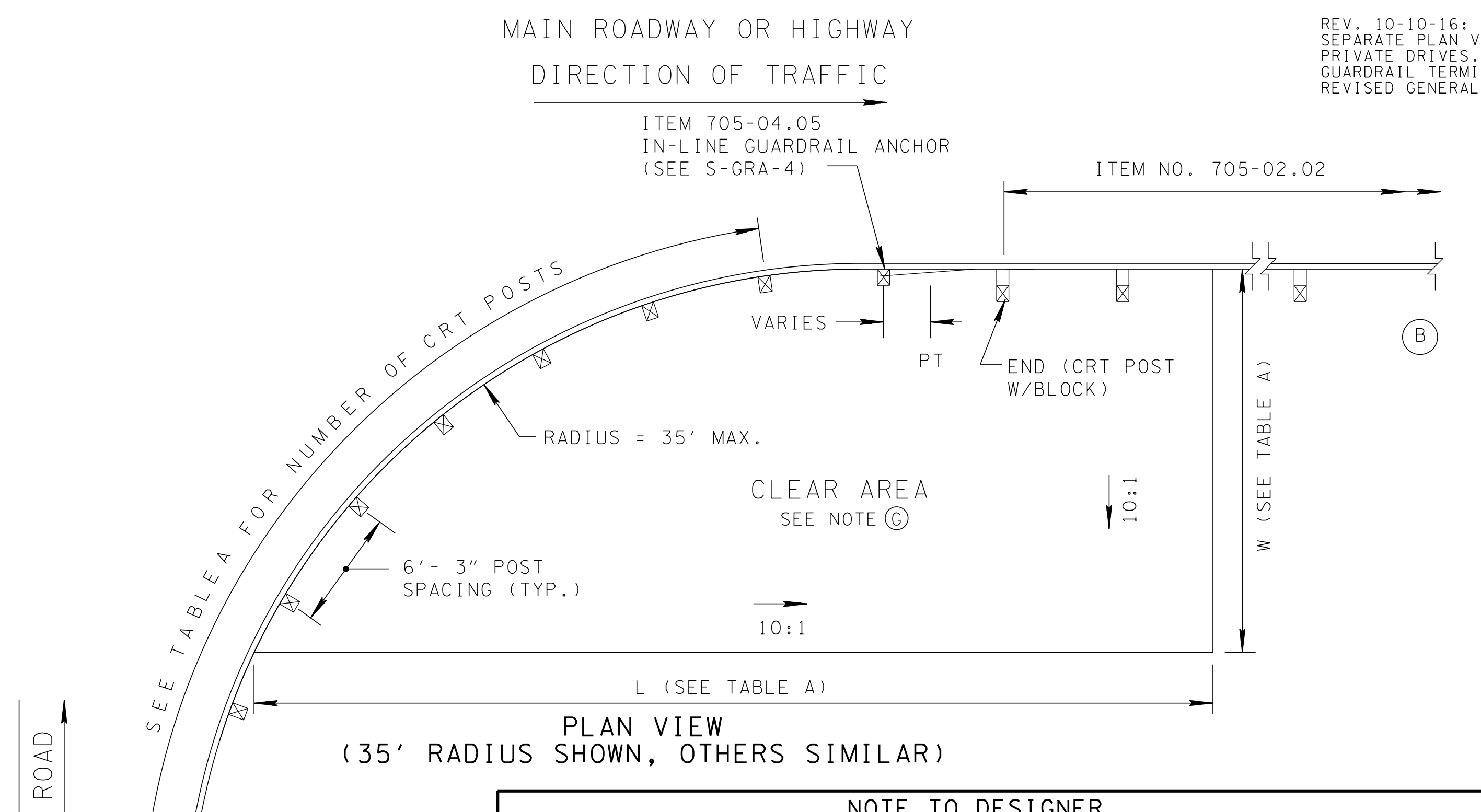
RADIUS	705-02.02	705-04.05
F 8'-6"	37'-6"	1 *
17'-0"	50'-0"	1 *
25'-6"	62'-6"	1 *
35'-0"	75'-0"	1 *

\* IF GUARDRAIL CONTINUES BEYOND POST 1, SEE NOTE E



**SPECIAL CRT POST NOTES**

- FEWER CRT POSTS ARE REQUIRED FOR SMALLER RADII; INCLUDE CRT POST AT POINT B. ATTACH GUARDRAIL TO POST WITH A 5/16" X 9" LONG BOLT, A 3/8" X 7 1/2" SNUG FITTING INSERT AND A 1 1/2" WASHER WITH NUT ON BACK OF POST.
- THE FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.



PLAN VIEW  
(35' RADIUS SHOWN, OTHERS SIMILAR)

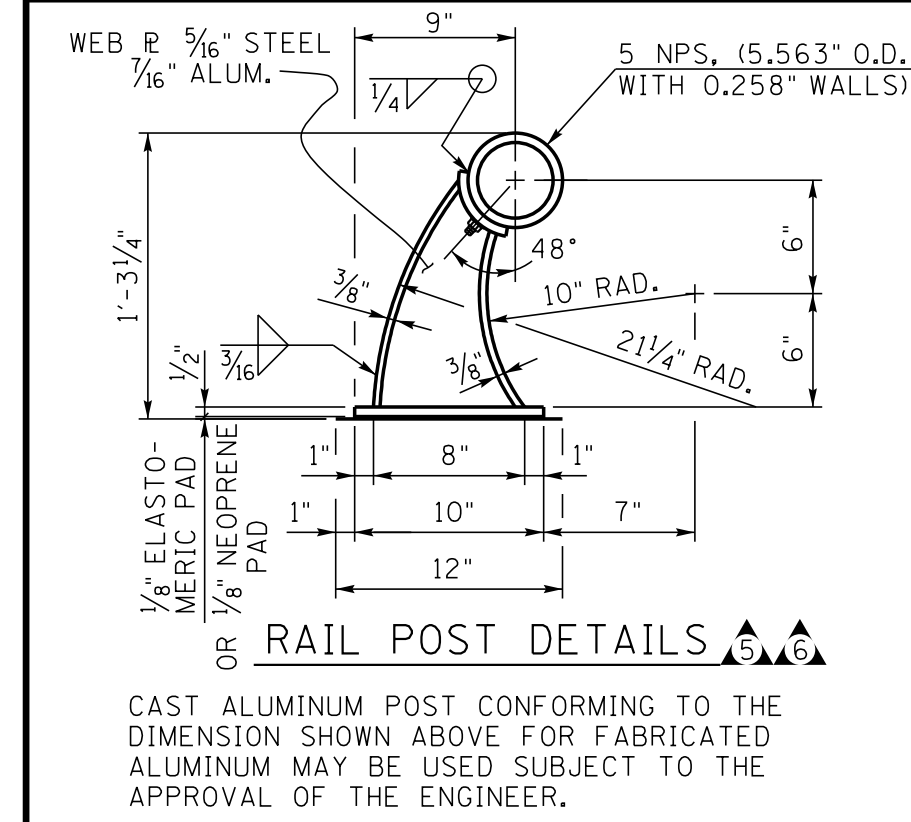
**NOTE TO DESIGNER**  
THIS STANDARD TO BE USED ON ROADWAYS ON THE NATIONAL HIGHWAY SYSTEM. FOR NON NATIONAL HIGHWAY SYSTEM FACILITIES, USE S-GRA-4.

**GENERAL NOTES**

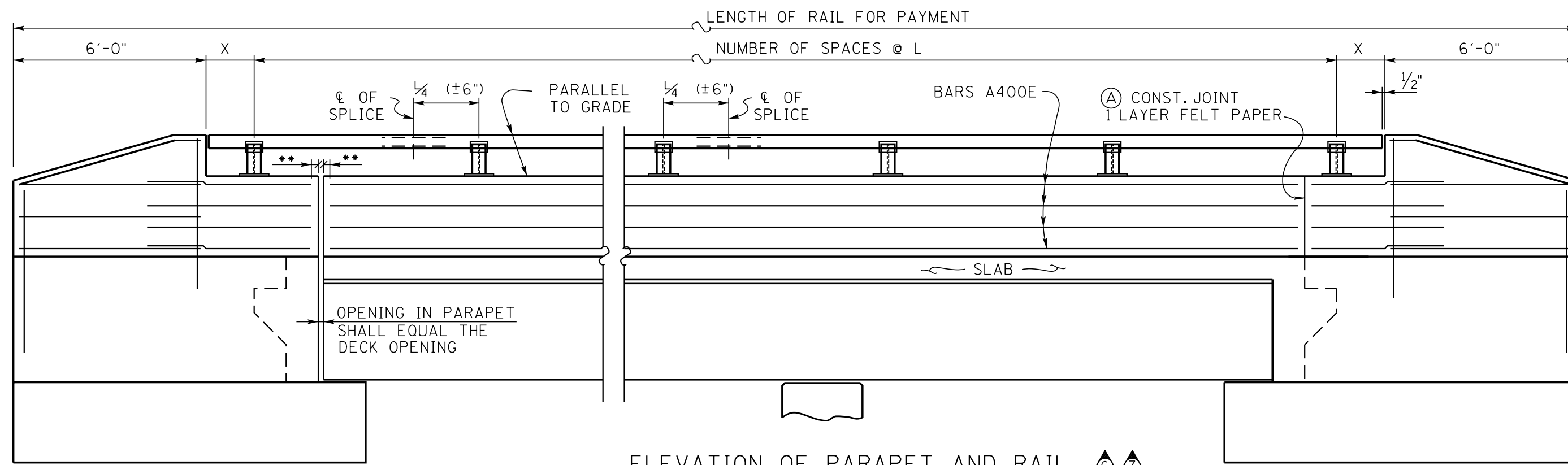
- THIS STANDARD DRAWING IS TO BE USED WHEN THE LENGTH OF NEED EXTENDS TO OR BEYOND AN INTERSECTION. DESIGNER IS TO VERIFY THAT THE ENTIRE LENGTH CAN BE CONSTRUCTED WITHIN THE PROPOSED RIGHT-OF-WAY. FOR INSTALLATION WHERE GUARDRAIL RADIUS IS NOT INCLUDED IN TABLE A, ROUND UP. FOR INSTALLATION WHERE GUARDRAIL RADIUS IS LARGER THAN 35 FEET, USE STANDARD INSTALLATION PER S-GR31-1.
- IF CONNECTING TO BRIDGE RAIL OR OTHER CONCRETE BARRIER, SEE S-GRC-1 FOR MINIMUM LENGTH OF TRANSITION SECTION BETWEEN GUARDRAIL AND RIGID WALL.
- THE FORESLOPE FROM THE EDGE OF THE SHOULDER INTO THE FACE OF GUARDRAIL SHOULD NOT BE STEEPER THAN 10(H):1(V).
- SEE S-GR31-1 AND S-GR31-1A FOR POSTS, RAIL, AND HARDWARE STANDARDS FOR CONSTRUCTION.
- USE APPROPRIATE END TERMINAL PER STANDARD DRAWINGS:  
FOR SIDEROADS > 45 MPH, USE S-GRT-2  
FOR SIDEROADS < 45 MPH, USE S-GRT-3  
FOR DRIVES, USE S-GRT-4
- DO NOT CONNECT RAIL TO CENTER POST IN CURVE FOR 8'-6" RADIUS DESIGN.
- THE CLEAR AREA BEHIND THE GUARDRAIL SHALL REMAIN UNOBSTRUCTED AND UNENCUMBERED TO ALLOW THE GUARDRAIL TO FUNCTION PROPERLY. OBSTACLES (I.E., ENDWALLS, SIGNS, DITCHES, ETC.) WITHIN THIS AREA MUST BE REMOVED, RELOCATED, OR REDESIGNED.
- W-BEAMS SHALL BE SHOP BENT AS REQUIRED.
- TO DETERMINE IF A ROAD IS ON THE NATIONAL HIGHWAY SYSTEM, CONSULT THE FUNCTIONAL CLASSIFICATION MAPS MAINTAINED BY THE TDOT LONG RANGE PLANNING DIVISION. SEE TDOT LONG RANGE PLANNING WEBSITE.
- THE CURVED GUARDRAIL INSTALLATION SHOWN ON THIS STANDARD DRAWING HAS BEEN EVALUATED PER NCHRP 350 TL-2.
- PAYMENT FOR TYPICAL INSTALLATION WILL BE UNDER ITEM NUMBERS:  
705-02.02 SINGLE GUARDRAIL (TYPE 2) PER LF  
705-04.03 GUARDRAIL TERMINAL (TYPE 13) PER EACH OR  
705-04.04 GUARDRAIL TERMINAL (TYPE 21) PER EACH OR  
705-04.05 GUARDRAIL TERMINAL (TYPE-IN-LINE) PER EACH  
705-04.07 TAN ENERGY ABSORBING TERM (NCHRP 350, TL3) PER EACH
- FOR RADIUS LESS THAN OR EQUAL TO 150', USE ITEM NO. 706-06.06 INSTEAD OF ITEM NO. 705-02.02.





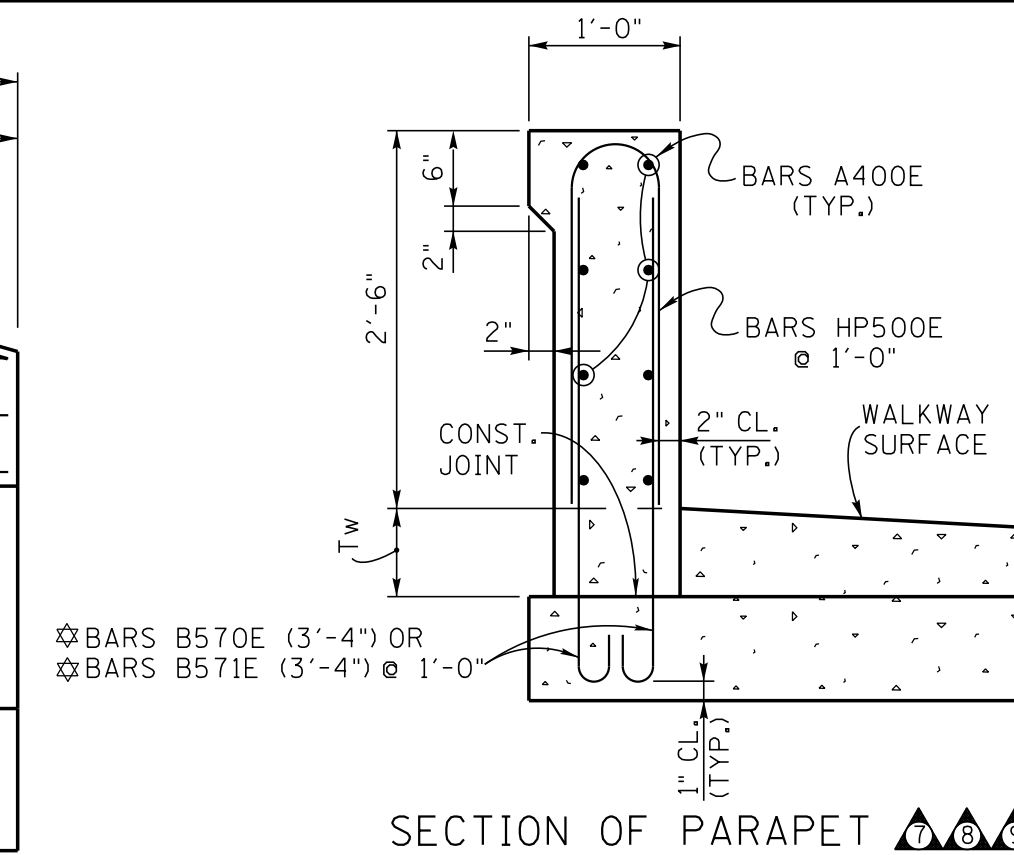


CAST ALUMINUM POST CONFORMING TO THE DIMENSION SHOWN ABOVE FOR FABRICATED ALUMINUM MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.



ELEVATION OF PARAPET AND RAIL  
(TYPICAL EXTERIOR VIEW OF CONTINUOUS BRIDGE)

NOTE: X: 9" MIN TO 1'-6" MAX.  
L: MAX = 10'-6"

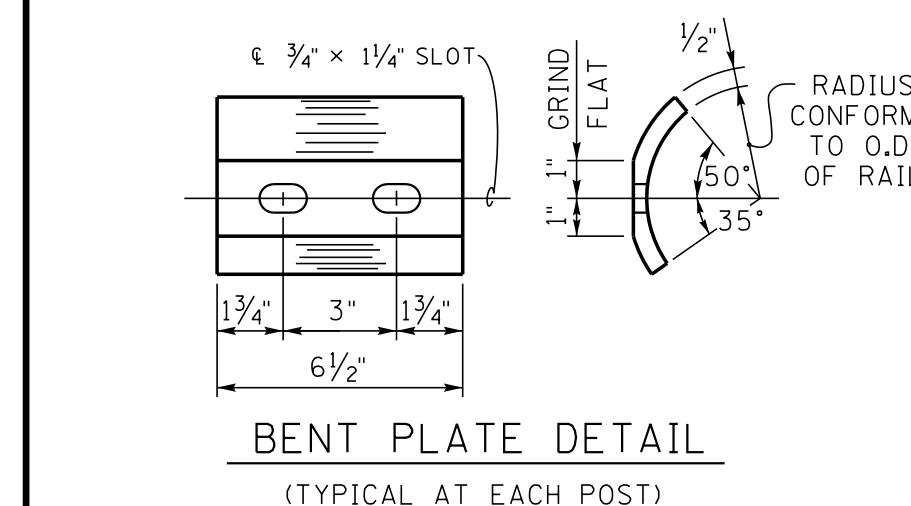


SECTION OF PARAPET

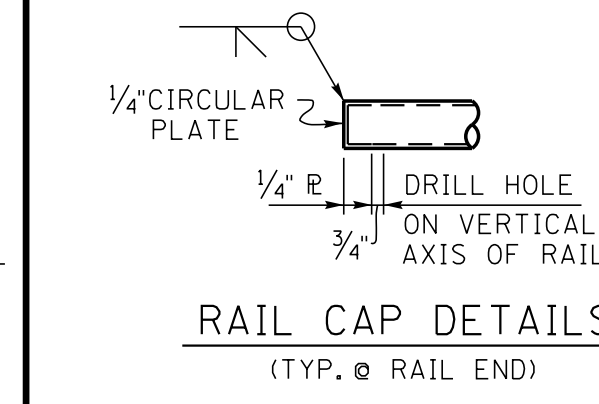
PROJECT NO.	YEAR	SHEET NO.	
	1988		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION
1	3-30-92	RMD	CHANGED LENGTH OF BOLTS
2	10-26-92	RMD	CHANGED WINGPOST DETAILS & NOTES
3	3-28-94	MAH	REVISED NOTE
4	12-18-95	BRB	REVISED SPACING OF WINGPOST REINF. AND LENGTH OF BOLT
5	4-28-97	MAH	REVISED RAIL SIZE & NOTE
6	5-21-99	MAH	ADDED V-GROOVE NOTE *8 & DELETED CASE NO. 2 RAILING DETAILS & REVISED RAIL POST DETAILS
7	7-31-00	CMH	REVISED NOTE *8, JOINT LOCATIONS, WINGPOST & PARAPET REINFORCING, WATERSTOP DETAIL & ADDED JOINT DETAIL, SLOPE BREAK, NOTE (A) & *9
8	1-5-01	CMH	REVISED SECTION OF PARAPET & DELETED NOTE *9 & WATERSTOP & ADDED NOTE UNDER QUANTITY BLOCK
9	8-13-02	CMH	REVISED SECTION OF PARAPET & BARS HP500E & NOTES & QUANTITIES
10	5-1-14	JHW	REVISED DIMENSIONS & QUANTITIES

GENERAL NOTES

- ⚠ (A) NOTE: CONTRACTOR MAY POUR THE PARAPET WITHOUT FELT PAPER PROVIDED HE FORMS A 1/2 INCH V-GROOVE ALONG THE TRAFFIC FACE AND TOP OF PARAPET DURING CASTING OF CONCRETE OR SOON AFTER SLIP-FORMING. DESIGN: AASHTO SPECIFICATIONS CURRENT EDITION WITH ADDENDA.
  - ⚠ (B) MATERIAL: TUBING AND RAIL POSTS MAY BE EITHER ALUMINUM OR STEEL. FOR ALUMINUM ALTERNATE: RAIL AND SPLICE SLEEVE TO BE ALLOY 6061-T6 OR 6063-T6, ASTM B429 FABRICATED POSTS - ALLOY 6061-T6, ASTM B209 CAST ALUMINUM POST - ALLOY A444, 0-T4 RAIL FASTENERS - ALLOY 2024-T4 FOR BOLTS AND ALLOY 6262-T9 FOR HEX NUTS, ASTM B211
  - ⚠ (C) FOR STEEL ALTERNATE: RAILING MEMBER - ASTM A53 GRADE A OR B STEEL PIPE SPLICE SLEEVE - ASTM A500 GRADE A OR B CARBON STEEL TUBING FABRICATED POST - ASTM A709 GRADE 36 RAIL FASTENERS - ASTM A307
  - ⚠ MISCELLANEOUS RAIL ITEMS. WATERSTOPS - SEE TENNESSEE HIGHWAY DEPARTMENT SPECIFICATIONS. ANCHOR PLATES - ASTM A709 GRADE 36. ANCHOR A307. INSERT ASSEMBLIES - FOR LOCATION SEE ROADWAY PLANS. ELASTOMERIC PADS OR NEOPRENE PADS - SEE TENNESSEE HIGHWAY DEPARTMENT SPECIFICATIONS.
  - ⚠ (D) RAIL ITEMS: BASIS OF PAYMENT TO BE PER LINEAR FOOT. THE ITEM INCLUDES ALL COMPONENTS OF THE RAIL, ITS ANCHORAGE, THE REINFORCED CONCRETE PARAPET, ENDPST AND MISCELLANEOUS RAIL ITEMS.
- FABRICATION AND ERECTION:
1. THE RAILING MEMBER SHALL BE CONTINUOUS FROM ENDPST TO ENDPST WITH EACH RAIL SEGMENT ATTACHED TO A MINIMUM OF THREE POSTS.
  2. ALIGNMENT AND PROFILE OF RAIL SHALL CONFORM TO PLANS DETAILS. RAIL SHALL BE PARALLEL TO AND POST NORMAL TO ROADWAY GRADE UNLESS OTHERWISE NOTED ON PLANS.
  3. OPEN JOINTS OR CONSTRUCTION JOINTS WILL BE REQUIRED AS SHOWN ON THIS SHEET OR AS MODIFIED ON CONTRACT DRAWINGS.
  4. NO CONCRETE FOR THE PARAPETS SHALL BE CAST ON ANY STRUCTURE UNTIL THE FLASHWORK HAS BEEN STRUCK.
  5. ALL METAL MATERIALS NOT SPECIFIED TO BE ALUMINUM ALLOY SHALL BE GALVANIZED TO THE APPLICABLE ASTM REQUIREMENTS. SEE NOTE 7 BELOW.
  6. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF EITHER THE "SPECIAL PROVISION FOR WELDED STRUCTURES" FOR STEEL RAIL ALTERNATE, OR "AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS" FOR ALUMINUM RAIL ALTERNATE. AFTER WELDING, ALL EXPOSED JOINTS SHALL BE FINISHED BY GRINDING TO GIVE A NEAT APPEARANCE.
  7. IF THE STEEL RAIL ALTERNATE IS SELECTED, ALL COMPONENTS SHALL BE HOT DIP GALVANIZED:
    - A) RAILING MEMBERS AND POSTS SHALL BE GALVANIZED TO ASTM REQUIREMENTS A153. ALL MISCELLANEOUS STEEL ITEMS SHALL BE GALVANIZED TO ASTM REQUIREMENTS A153.
    - B) ALL FABRICATION SHALL BE COMPLETE AND READY FOR ASSEMBLY BEFORE GALVANIZING EXCEPT THAT NUTS FOR ALL FASTENERS ARE TO BE RETAPPED AFTER GALVANIZING.
    - C) GALVANIZED MEMBERS SHALL BE FREE FROM DROSS, FLUX AND ROUGH-COATING CAUSED BY LOW VAT TEMPERATURES.
  8. A 1/2 INCH DEEP V-GROOVE ALONG THE TRAFFIC FACE AND TOP OF PARAPET SHALL BE FORMED DURING CASTING OF CONCRETE OR SOON AFTER SLIP-FORMING @ 10'-0" CENTER-TO-CENTER.

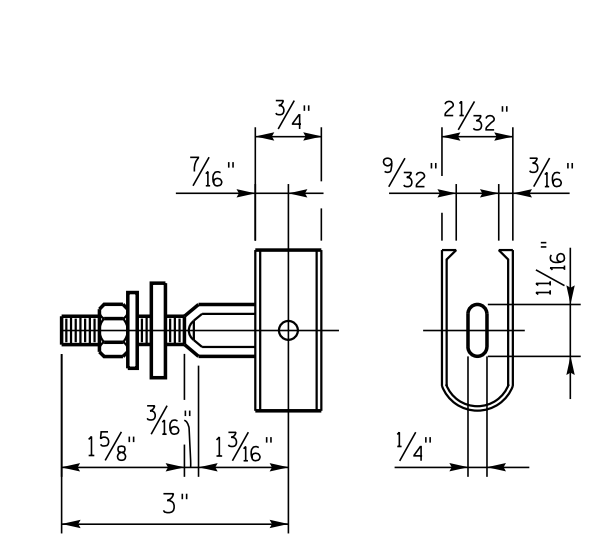


BENT PLATE DETAIL  
(TYPICAL AT EACH POST)



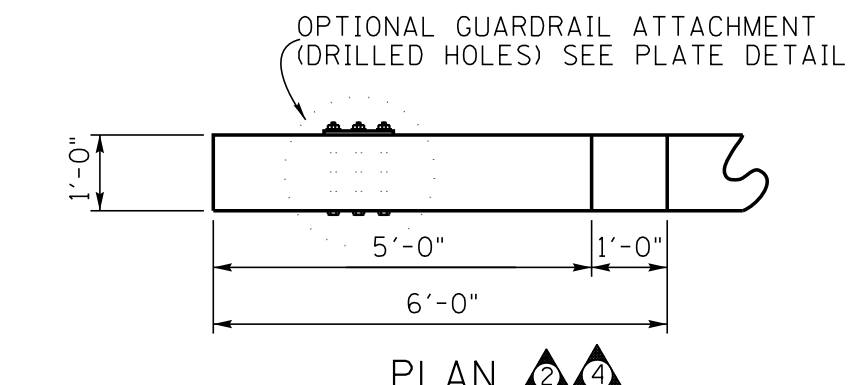
RAIL CAP DETAILS  
(TYP. @ RAIL END)

\*\* DENOTES: REINFORCING STEEL TO CLEAR 3" FROM CONSTRUCTION JOINT OR EXPANSION JOINT.

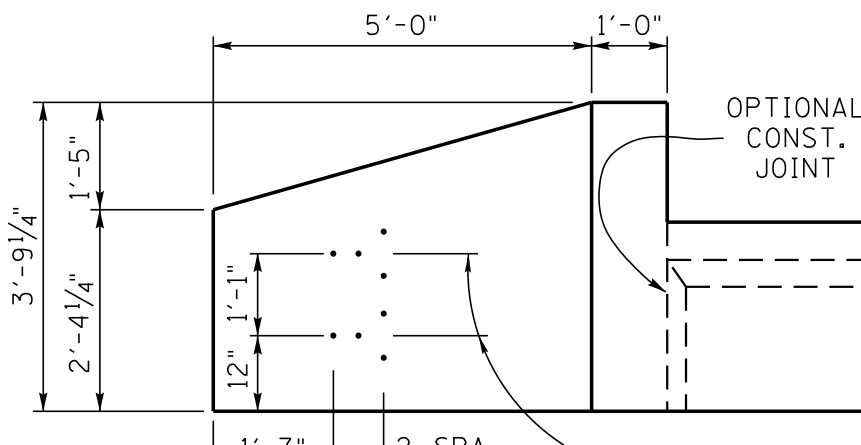


TOGGLE BOLT ASSEMBLY

NOTE: ALTERNATE DETAILS MAY BE SUBMITTED TO THE BRIDGE ENGINEER FOR APPROVAL. FASTENERS CONFORMING TO ASTM B211 SHALL HAVE AN ANODIC COATING OF .0002 INCH MINIMUM THICKNESS WITH DICHROMATE OR BOILING WATER SEAL.

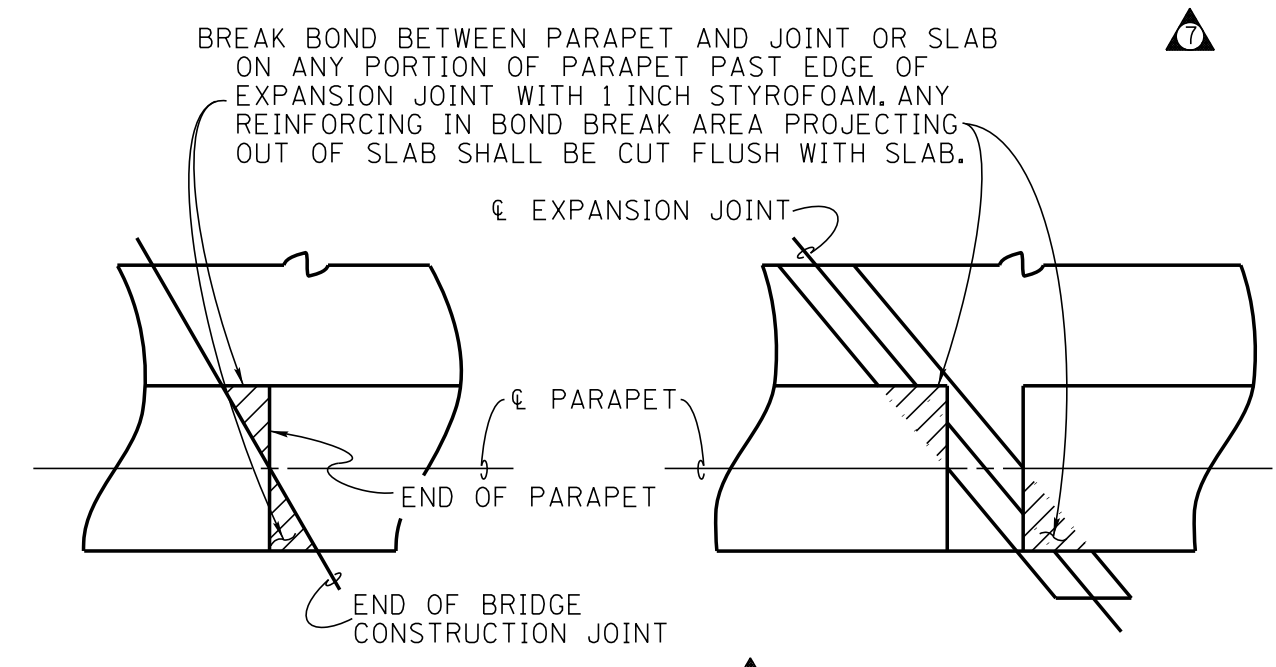


PLAN



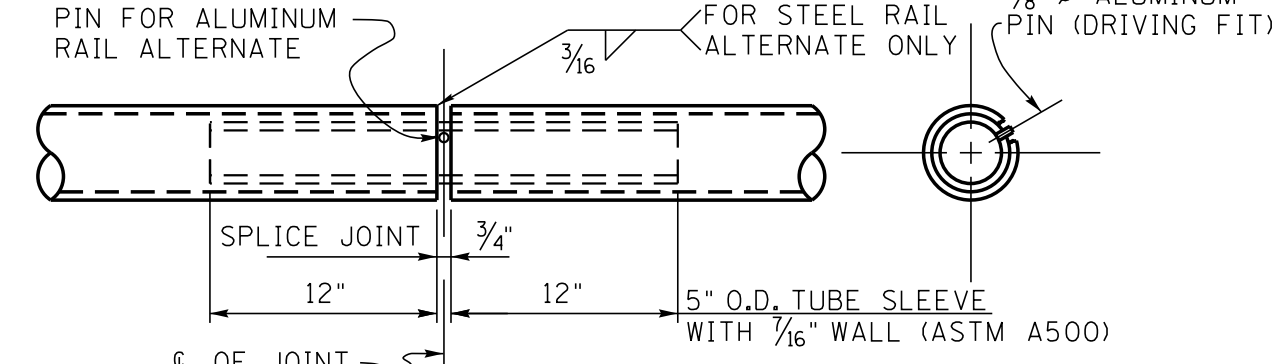
ELEVATION

FERRULE SHALL HAVE CLOSED ENDS AND TAPPED OVERSIZED AS SPECIFIED BY ASTM A563, TABLE 5. ASSEMBLY SHALL BE BOLTED TO FORMS, (HAND TIGHT), DURING CONCRETE POURING AND CURING.



EXPANSION & SPLICE JOINTS

(RAIL EXPANSION JOINTS TO BE USED AT ALL JOINTS IN BRIDGE DECK WITH TUBE OPENING EQUAL TO SLAB OPENING)

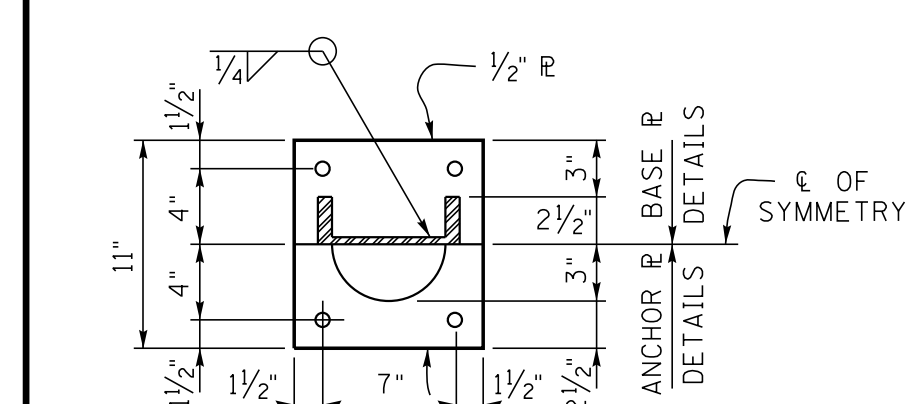


BAR DETAILS

- ① -BAR DIMENSIONS ARE OUTSIDE TO OUTSIDE, FIRST DIGIT OF NUMBER INDICATES SIZE.
- ② -THESE BARS SHALL BE FULL LENGTH OF PARAPET AND ARE TO EXTEND 2'-0" INTO WINGPOST.
- ③ -ALL REINFORCING STEEL TO BE ASTM A615 GRADE 60 EPOXY COATED.

WINGPOST QUANTITIES * (EACH)		PARAPET QUANTITIES * (PER FOOT)	
CLASS "A" CONCRETE C.Y.	EPOXY REINF STEEL LB.	CLASS "A" CONCRETE C.Y.	EPOXY REINF STEEL LB.
.78	30.6	.081	10.3

⚠ \* BARS A570E AND BARS B570E TO BE INCLUDED IN EPOXY COATED REINFORCING QUANTITIES AND BILL OF STEEL FOR WINGWALLS.  
⚠ \* BARS B571E TO BE INCLUDED IN EPOXY COATED REINFORCING QUANTITIES AND BILL OF STEEL FOR SUPERSTRUCTURE.  
NOTE: BARS LISTED IN ABOVE NOTES ARE NOT INCLUDED IN WINGPOST QUANTITIES OR PARAPET QUANTITIES SHOWN THIS SHEET.  
⚠ \* NOTE: QUANTITIES DO NOT INCLUDE PARAPET OR WINGPOST CONCRETE WITHIN DEPTH T<sub>w</sub> SHOWN IN PARAPET SECTION ABOVE.

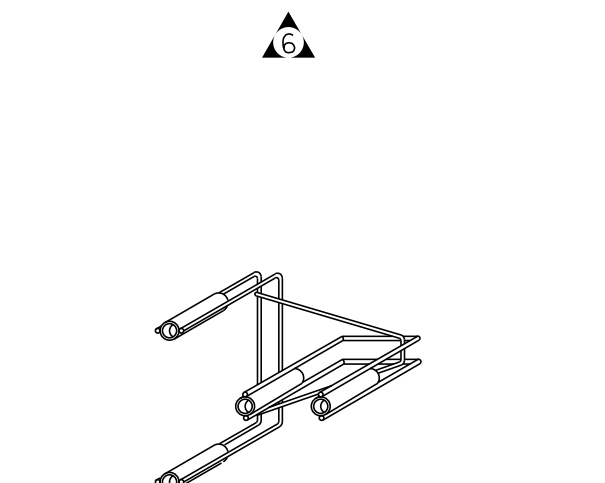


ANCHORAGE DETAIL  
(SHOWING PART SECTION AT PARAPET)



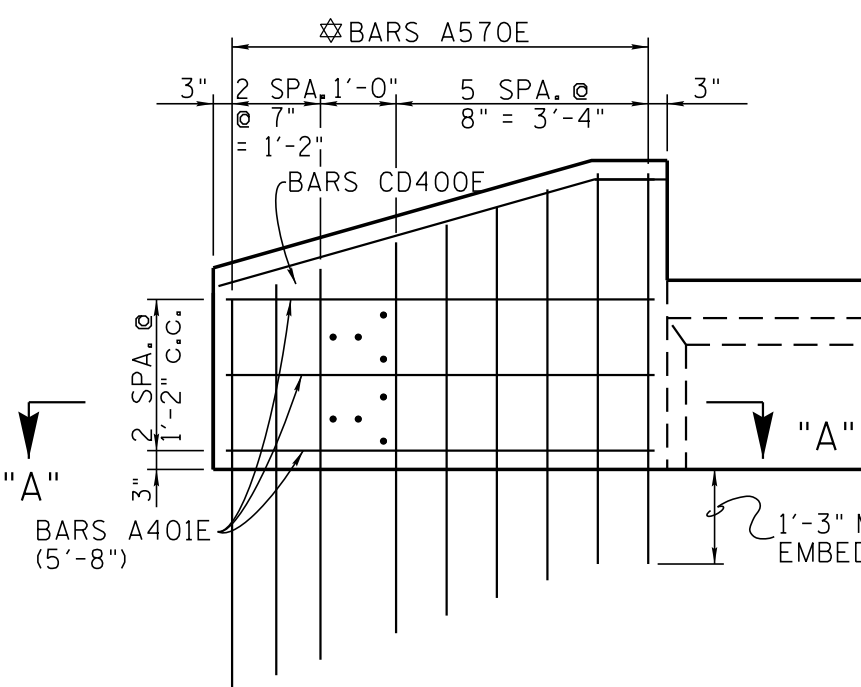
PLATE DETAIL

1/2" ASTM A36 GALVANIZED PLATE WITH 3/8" HEX HEAD GALVANIZED BOLTS (A307) HOT DIP ZINC COATING A153

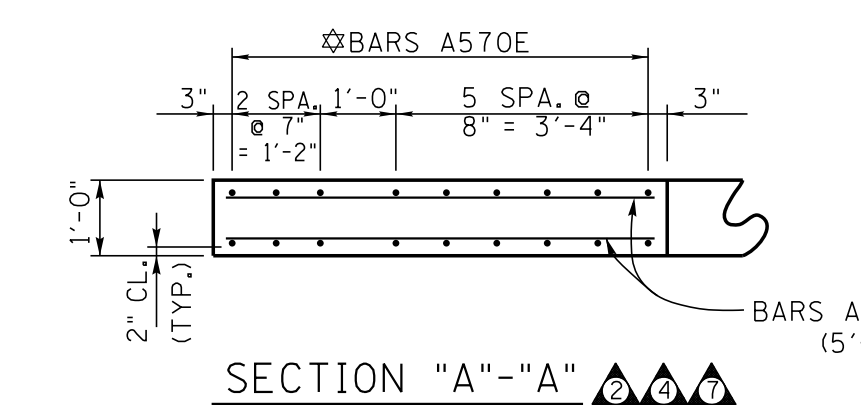


INSERT ASSEMBLY

CAST IN PLACE THREADED STEEL INSERT WITH 3/8" x 2" HEX HEAD GALVANIZED BOLTS (A307) HOT DIP ZINC COATING ASTM A153



ELEVATION



SECTION "A"-A

DESIGNED BY: T. LEWIS  
DRAWN BY: J. FIELDS  
SUPERVISED BY: J. FIELDS  
CHECKED BY: \_\_\_\_\_  
DATE: 4-88  
DATE: 4-88  
DATE: \_\_\_\_\_

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
BRIDGE RAILING  
CONCRETE PARAPET WITH  
STRUCTURAL TUBING  
1988

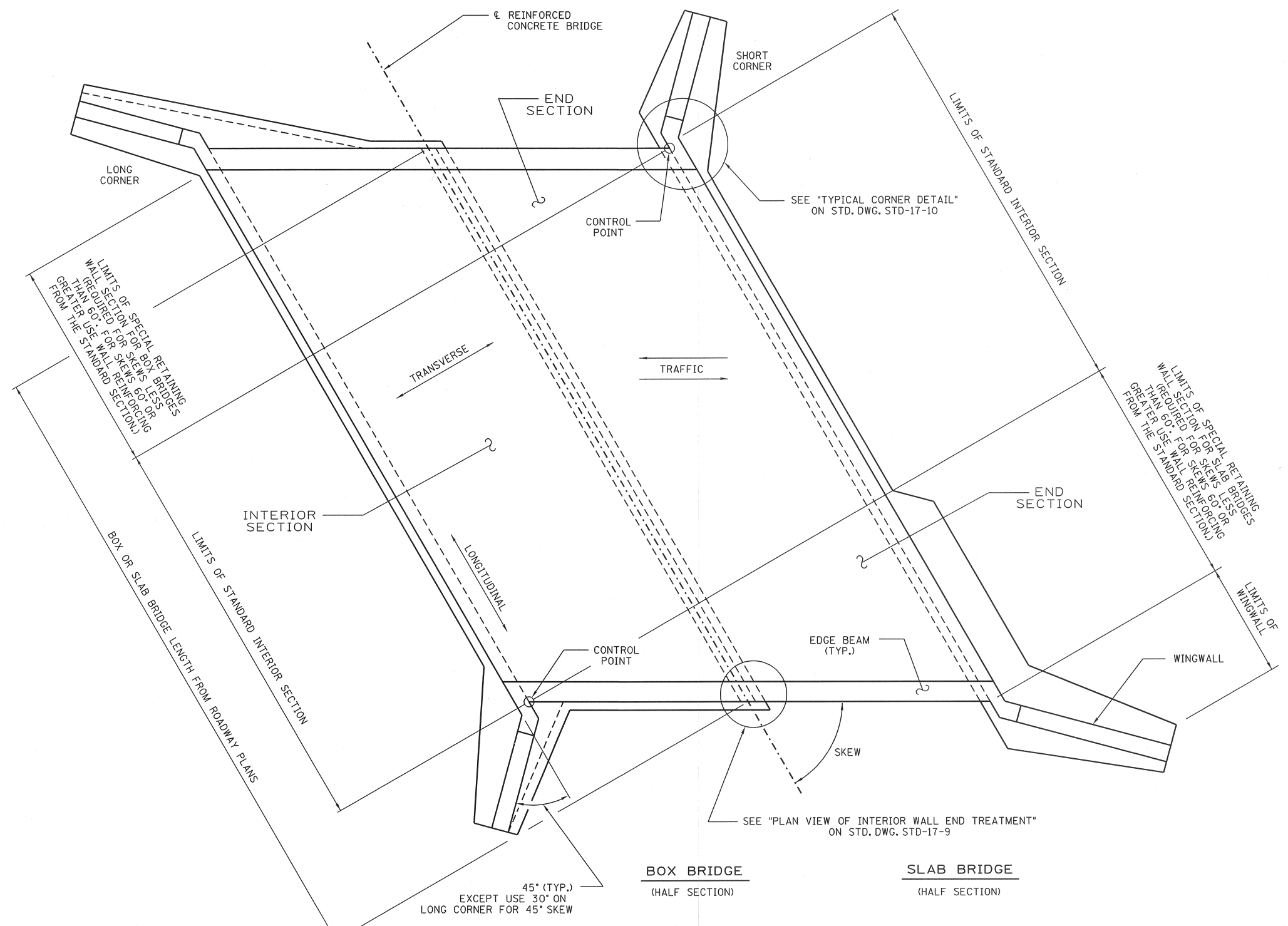
CORRECT *Edward P. Wasserman*  
ENGINEER OF STRUCTURES







CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



**REINFORCED CONCRETE BRIDGE TERMINOLOGY**

(2 BARREL SHOWN; 1 BARREL AND 3 BARREL SIMILAR)  
(RIGHT SKEW SHOWN; LEFT SKEW OPPOSITE HAND)

CONTROL POINT: INTERSECTION OF OUTSIDE EDGE OF THE TOP OF THE CURB WITH THE INSIDE FACE OF THE EXTERIOR WALL.

SEE STD-17-15 AND 28 FOR SPECIAL RETAINING WALL SECTION DETAILS.

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
**TERMINOLOGY OF DRAWINGS**

**STANDARD REINFORCED CONCRETE BRIDGE BOX AND SLAB TYPE**

2010

CORRECT *Edward P. Wasserman*  
ENGINEER OF STRUCTURES

DESIGNED BY	CMH / MAH	DATE	12-09
DRAWN BY	DIANE BUSH	DATE	04-10
SUPERVISED BY	RLH / JWP / MAH	DATE	12-09
CHECKED BY		DATE	

D:\DGN\std171.dgn 1413 2010

**DESIGN NOTES**

SPECIFICATIONS: "TDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION (MARCH 1, 2006 EDITION) AND SUPPLEMENTAL SPECIFICATIONS.

DESIGN SPECIFICATIONS: "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" 4TH EDITION (2007) WITH 2009 INTERIMS.

LOADING: HL-93 LIVE LOADING.

EARTH LOAD: BASED ON SOIL WEIGHT OF 120 PCF AND 1.15 SOIL-STRUCTURE INTERACTION FACTOR.  
LATERAL EARTH PRESSURE: MAXIMUM OF 0.50 TIMES SOIL WEIGHT; MINIMUM OF 0.25 TIMES SOIL WEIGHT.

CONCRETE: SHALL BE CLASS "A" (CAST IN PLACE) WITH CONCRETE STRENGTH  $f'_c = 3000$  psi.

WHEN HEIGHT OF FILL ABOVE THE TOP SLAB IS LESS THAN 1 FOOT, THE TOP MAT OF REINFORCING IN THE TOP SLAB SHALL BE CONSTRUCTED WITH  $2\frac{1}{2}$  INCHES OF CONCRETE COVER.

REINFORCING STEEL: SHALL BE ASTM A615 GRADE 60. SEE SECTION 604 AND 907 OF THE STANDARD SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS 600. WHEN FILL ON THE STRUCTURE IS LESS THAN 1 FOOT, EPOXY COATED REINFORCING STEEL SHALL BE USED IN THE TOP MAT OF THE TOP SLAB AND CURBS INCLUDING THE TIE (STIRRUP) BARS IN THE CURBS.

SPAN AND FILL HEIGHT: BOX AND SLAB BRIDGES ARE DESIGNED FOR THE SPANS AND FILL HEIGHTS SHOWN IN THE TABLES. FOR OTHER SPANS OR FILL HEIGHTS, A SPECIAL DESIGN IS REQUIRED. FILL HEIGHT, AS SHOWN IN THE TABLES, IS MEASURED FROM THE BOTTOM OF THE TOP SLAB TO THE TOP OF THE FILL. TO OBTAIN THE TOTAL HEIGHT OF FILL FROM THE FLOW LINE, ADD THE HEIGHT OF THE BOX. WHEN THE FILL ON THE STRUCTURE IS LESS THAN 1 FOOT, USE THE "NO FILL" SECTION AS SHOWN IN THE TABLES.

NON-UNIFORM LOADS: THE BOX AND SLAB BRIDGE DESIGNS SHOWN ASSUME UNIFORM LOADING ON EACH EXTERIOR WALL. FOR SIGNIFICANTLY NON-UNIFORM LOADS (FOR EXAMPLE, IF THE BOX OR SLAB BRIDGE RUNS ALONG THE TOE OF AN EMBANKMENT OR NEXT TO A RETAINING WALL) A SPECIAL DESIGN IS REQUIRED.

FOUNDATION BEARING PRESSURE: BOX AND SLAB BRIDGE FOOTINGS AND WINGWALL FOOTINGS SHALL BE FOUNDED ON SUITABLE FOUNDATION MATERIAL. UNSATISFACTORY MATERIAL IN THE FOUNDATION SHALL BE REMOVED IN ACCORDANCE WITH SECTION 204.10 OF THE SPECIFICATIONS.

**CONSTRUCTION NOTES**

BOX AND SLAB CONSTRUCTION DRAWINGS: THE CONTRACTOR SHALL PREPARE WORKING DRAWINGS WHICH SHOW PROPOSED CONSTRUCTION JOINTS, CONTRACTION JOINTS, SPLICES OF REINFORCING, AND THE BILL OF STEEL. THESE WORKING DRAWINGS SHALL BE SUBMITTED TO THE FIELD ENGINEER FOR REVIEW PRIOR TO BEGINNING CONSTRUCTION.

REINFORCING BAR SUPPORT DETAILS: SEE STANDARD DRAWING STD-9-1.

BRIDGE DECK FORMS: BRIDGE DECK FORMS FOR BOX AND SLAB BRIDGE CONCRETE DECKS SHALL BE CONSTRUCTED USING EITHER REMOVABLE FORMS OR PERMANENT FORMS. PERMANENT FORMS MAY BE REMAIN-IN-PLACE STEEL FORMS SHALL BE ATTACHED BY MEANS OTHER THAN WELDING TO REINFORCING STEEL. SEE SECTION 604.05 OF THE SPECIFICATIONS. WALL HEIGHTS SHALL BE INCREASED THE DEPTH OF THE CORRUGATIONS OF THE METAL DECKING IN ORDER TO MAINTAIN THE CLEAR BOX DIMENSIONS CALLED FOR ON THE PLANS. PRECAST PRESTRESSED CONCRETE DECK PANELS ARE NOT ALLOWED.

BACKFILL: BACKFILLING OF BOX AND SLAB BRIDGES AND WINGWALLS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 204.11 OF THE STANDARD SPECIFICATIONS. THE REQUIREMENTS FOR STEPPING OF BOUNDARY SLOPES TO PREVENT WEDGE ACTION, FOR PROPER LAYERING AND COMPACTING OF BACKFILL, AND FOR MAINTAINING (AT ALL TIMES) EQUAL HEIGHTS OF BACKFILL AGAINST EXTERIOR WALLS OF BOX AND SLAB BRIDGES SHALL BE STRICTLY ENFORCED. SEE STANDARD STD-17-17 & 18 FOR OTHER NOTES AND DETAILS.

PAVED OUTLET DETAILS: SEE STANDARD DRAWING STD-17-19. PAVED OUTLETS SHALL BE USED WHEN SPECIFIED ON THE PLANS.

DEBRIS DEFLECTION WALL: SEE STANDARD STD-17-21 & 22. A DEBRIS DEFLECTION WALL SHALL BE CONSTRUCTED ON THE INLET END OF THE BOX OR SLAB BRIDGE WHEN SPECIFIED ON THE PLANS.

CONTRACTION JOINTS: UNLESS OTHERWISE SPECIFIED ON THE PLANS, TRANSVERSE CONTRACTION JOINTS SHALL BE PLAIN BUTT JOINTS, AND LONGITUDINAL REINFORCEMENT SHALL NOT EXTEND ACROSS THE JOINT. CONTRACTION JOINTS SHALL BE SPACED AT INTERVALS OF 30 FEET TO 40 FEET. THE LOCATION OF JOINTS SHALL BE PREDETERMINED, AND WHEN PRACTICABLE, SHALL BE LOCATED AT CHANGES IN THE BOX OR SLAB BRIDGE SECTION. THESE JOINTS SHALL BE LOCATED PERPENDICULAR TO THE WALLS. WHERE THE BOX OR SLAB BRIDGE TOP SLAB IS TO BE THE RIDING SURFACE, NO CONTRACTION JOINTS SHALL BE USED, REGARDLESS OF THE LENGTH OF THE BARRELS.

STAGE CONSTRUCTION JOINTS (FILL NOT GREATER THAN 3'-6"): WHEN A BOX OR SLAB BRIDGE MUST BE STAGE CONSTRUCTED SUCH THAT THE CONSTRUCTION JOINT IS NOT PERPENDICULAR TO THE BRIDGE, THE STAGE CONSTRUCTION JOINT SHALL BE A PLAIN BUTT JOINT, AND NO REINFORCEMENT SHALL EXTEND ACROSS THE JOINT. ADDITIONAL SLAB REINFORCEMENT PLACED PARALLEL TO THE JOINT AND DOWEL BARS PERPENDICULAR TO THE JOINT IN ACCORDANCE WITH STANDARD DRAWING STD-17-25 SHALL BE PROVIDED. THE STAGE CONSTRUCTION JOINT SHALL NOT BE LOCATED WITHIN A FINAL TRAFFIC LANE.

STAGE CONSTRUCTION JOINTS (FILL GREATER THAN 3'-6"): JOINT SHALL BE CONSTRUCTED AS SPECIFIED FOR CONTRACTION JOINTS. SEE SKETCH THIS SHEET.

STAGE CONSTRUCTION OF BARRELS: FOR A MULTI-BARREL BOX OR SLAB BRIDGE WHERE BARRELS ARE STAGE CONSTRUCTED, THE SLAB BARS SHALL BE SPLICED THE MINIMUM LENGTH IN ACCORDANCE WITH THE TABLE ON THIS DRAWING. THE CONTRACTOR SHALL SUBMIT HIS PLAN FOR STAGE CONSTRUCTION SHOWING PROPOSED JOINT LOCATION AND BAR SPLICE LENGTHS TO THE FIELD ENGINEER FOR REVIEW PRIOR TO BEGINNING CONSTRUCTION.

SLAB BRIDGE FOOTINGS ON ROCK: THE BOTTOM OF FOOTING SHALL FOLLOW THE ROCK SURFACE ALONG THE WALL LINE. HOLES 1.5 INCH IN DIAMETER AND 2'-6" IN DEPTH SHALL BE DRILLED ON 12 INCH CENTERS INTO COMPETENT ROCK. THE HOLES SHALL BE AIR BLOWN TO REMOVE ALL DEBRIS AND FILLED WITH NON-SHRINK GROUT. ALL GROUTING MATERIAL SHALL BE APPROVED BY THE DIVISION OF MATERIALS AND TESTS AND PLACED IN THE DRILL HOLE AS RECOMMENDED BY THE MANUFACTURER. IF THE HOLE CANNOT BE DEWATERED THEN THE GROUT MUST BE PLACED THROUGH A TREMIE TUBE OR PRESSURE PUMPED WITH THE INITIAL PUMP NOZZLE AT BOTTOM OF HOLE. NO. 8 REINFORCING BARS SHALL BE ROTATED FULL DEPTH OF HOLES. SLIGHT TAPPING WILL BE ALLOWED DURING THE BAR ROTATION PROCESS BUT TAPPING WITHOUT ROTATION WILL NOT BE ALLOWED.

BOX EXTENSION DETAILS: SEE STANDARD DRAWINGS STD-17-26 AND 27.

CURING CONCRETE: SLABS FOR BOX AND SLAB BRIDGES SHALL BE CURED IN ACCORDANCE WITH ARTICLE 604.23 OF THE STANDARD SPECIFICATIONS.

REMOVAL OF FORMS: FORM REMOVAL SHALL BE IN ACCORDANCE WITH ARTICLE 604.19 AND 604.28 OF THE STANDARD SPECIFICATIONS. GENERALLY, FORMS FOR WALLS MAY BE REMOVED WITHIN 12-48 HOURS. FALSEWORK FOR SLABS MAY BE REMOVED AFTER 7 DAYS OF CURING ABOVE 40° F AND THE REQUIRED CONCRETE STRENGTH IS REACHED. NO LOADS SHALL BE PLACED ON THE SLAB UNTIL 10 ADDITIONAL DAYS AFTER REMOVING FORMS HAVE ELAPSED.

CONCRETE FINISH: SEE STANDARD SPECIFICATION ARTICLES 604.21 AND 604.22. IN GENERAL, CURBS, EDGES OF SLAB, EXPOSED FACES AND ENDS OF WINGWALLS, DEBRIS DEFLECTION WALLS, ENDS OF INTERIOR WALLS, AND EXPOSED FACE OF ENDWALLS SHALL RECEIVE A CLASS II FINISH.

CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION

LIST OF STANDARD DRAWINGS DWG. NO.

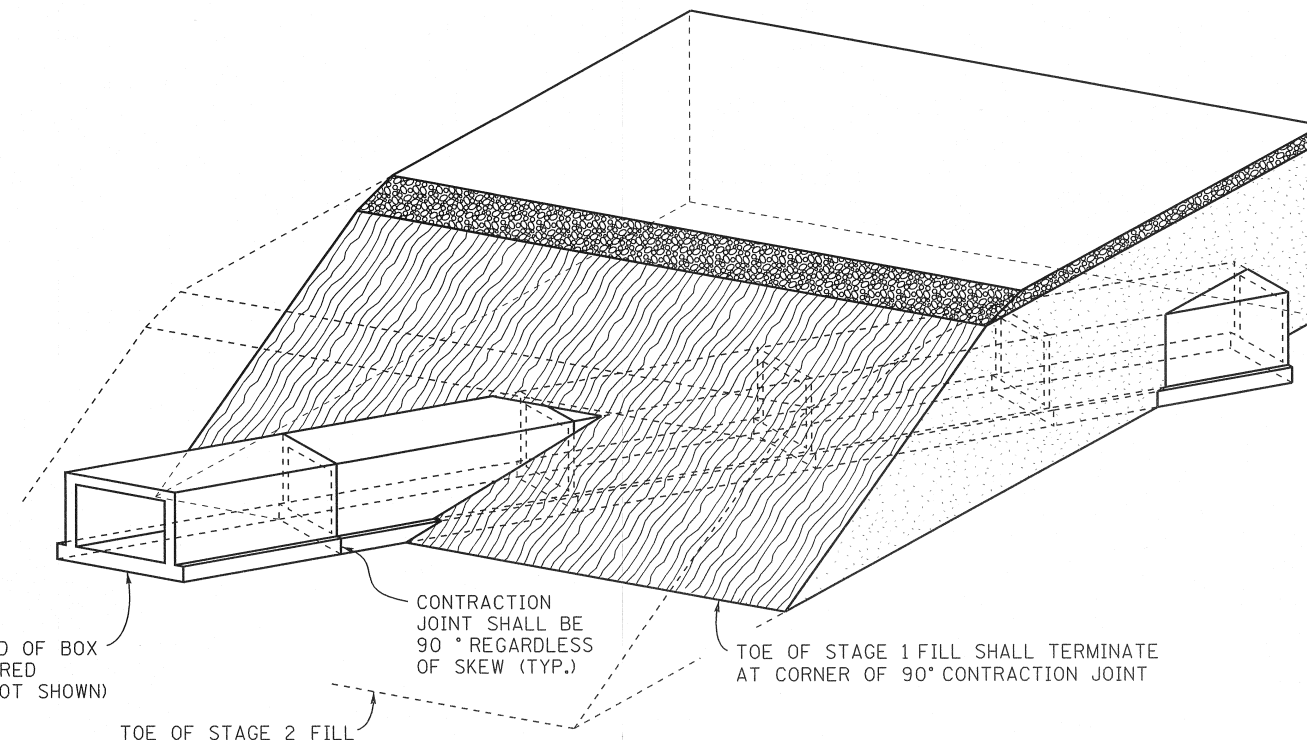
REINFORCING BAR SUPPORT DETAILS FOR CONCRETE SLABS ----- STD-9-1

REINFORCING BAR MIN. SPLICE LENGTHS

BAR SIZE	MIN. SPLICE LENGTH	LB. / SPLICE
4	1'-11"	1.28
5	2'-5"	2.52
6	3'-1"	4.63
7	4'-2"	8.52
8	5'-5"	14.46
9	6'-11"	23.52
10	8'-9"	37.65
11	10'-9"	57.11

EPOXY BAR MIN. SPLICE LENGTHS

BAR SIZE	MIN. SPLICE LENGTH	LB. / SPLICE
4	2'-4"	1.56
5	2'-11"	3.04
6	3'-9"	5.63
7	5'-0"	10.22
8	6'-7"	17.58
9	8'-4"	28.33
10	10'-7"	45.54
11	13'-0"	69.07



STAGE CONSTRUCTION SKETCH (FILL GREATER THAN 3'-6")

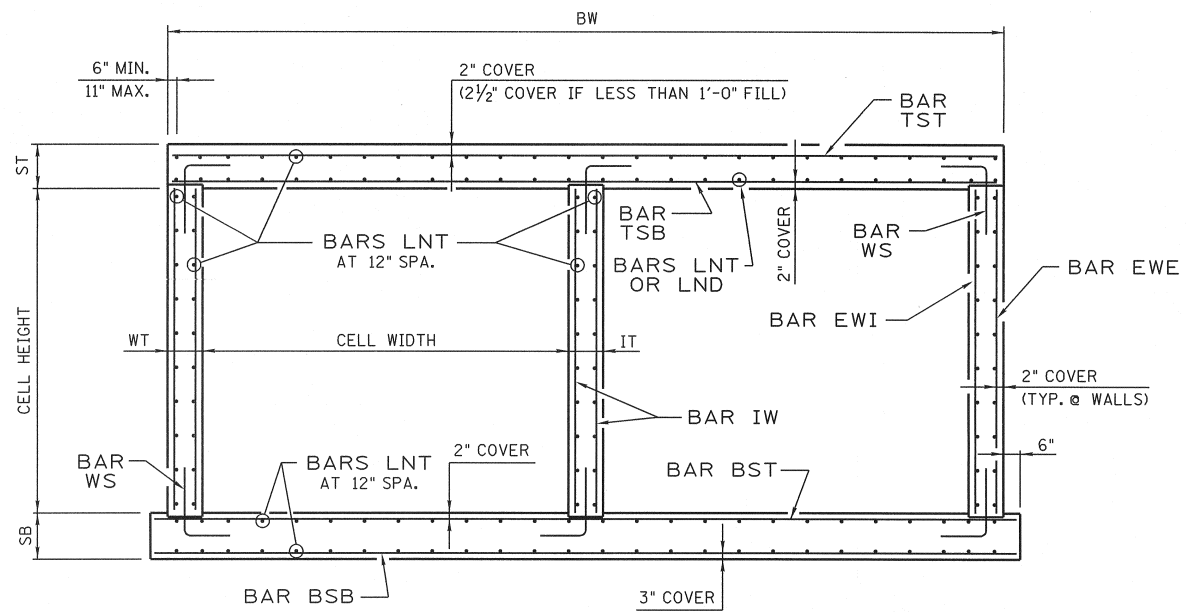
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
GENERAL NOTES  
STANDARD REINFORCED  
CONCRETE BRIDGE  
BOX AND SLAB TYPE

2010

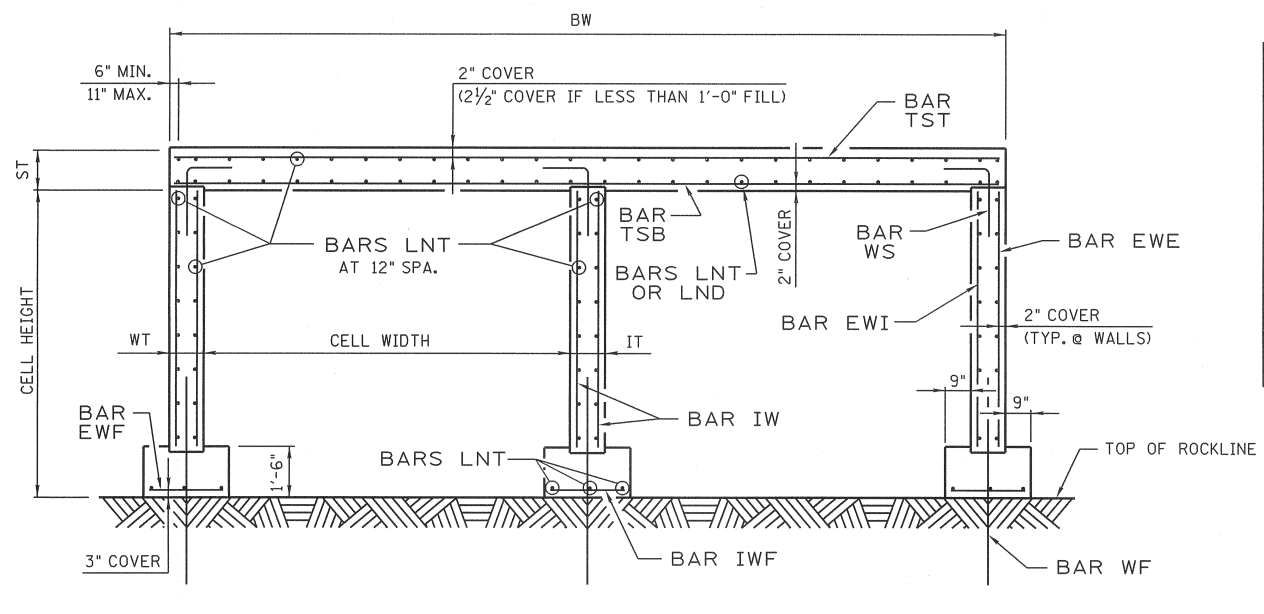
DESIGNED BY: CMH / MAH DATE: 12-09  
DRAWN BY: DIANE BUSH DATE: 04-10  
SUPERVISED BY: RLH / JWP / MAH DATE: 12-09  
CHECKED BY: DATE:

CORRECT *Edward P. Wasserman*  
ENGINEER OF STRUCTURES





BOX BRIDGE



SLAB BRIDGE

TYPICAL SECTIONS

NOTE: TWO BARREL TYPICAL SECTIONS SHOWN. SINGLE BARREL AND THREE BARREL ARE SIMILAR.

CONST. NO.		
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		BRIEF DESCRIPTION

BOX DIMENSION DESIGNATIONS

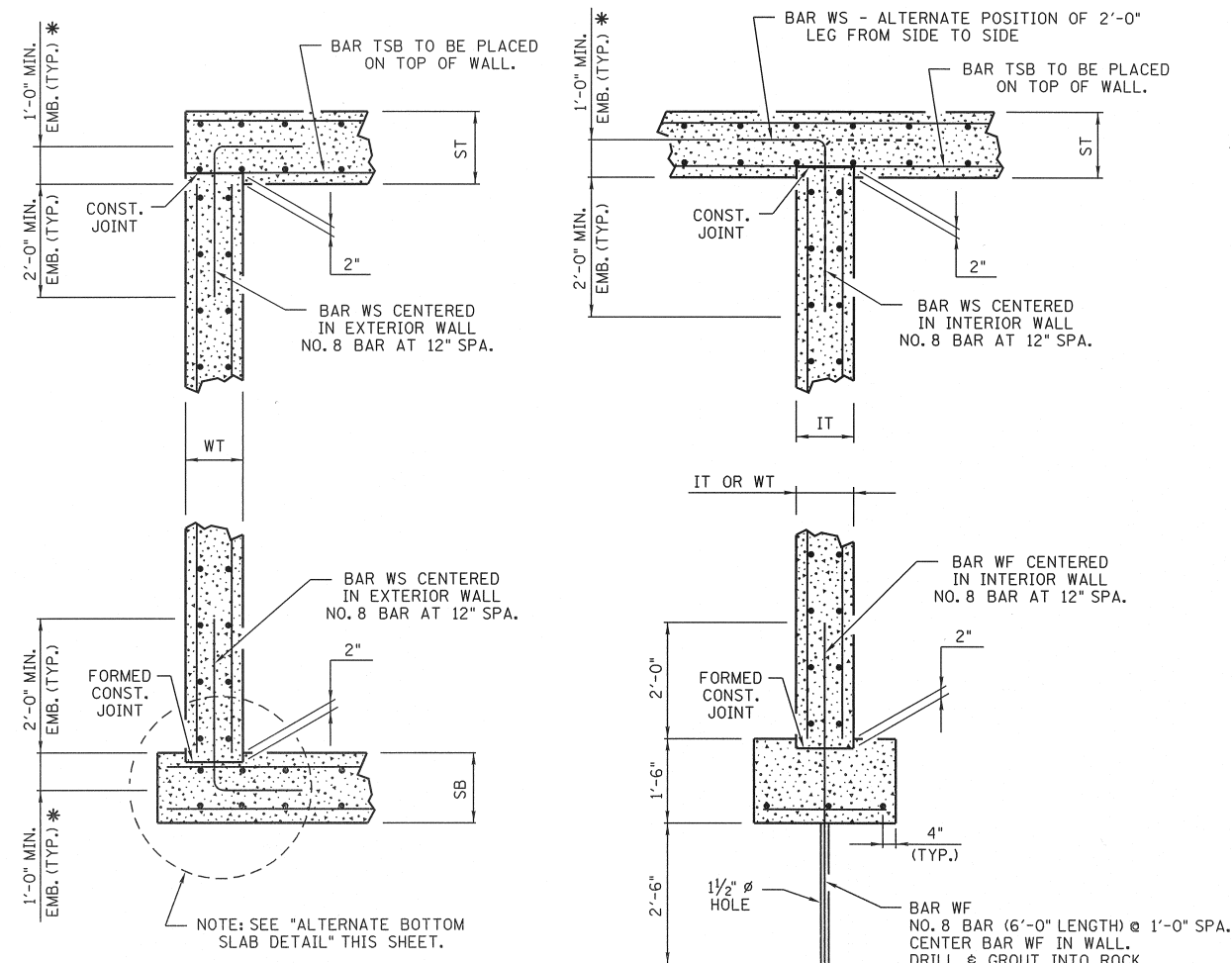
THE BOX DIMENSION DESIGNATIONS IDENTIFY THE BOX ELEMENTS AS FOLLOWS:

- SB = BOTTOM SLAB THICKNESS
- ST = TOP SLAB THICKNESS
- WT = EXTERIOR WALL THICKNESS
- IT = INTERIOR WALL THICKNESS
- BW = BOX WIDTH

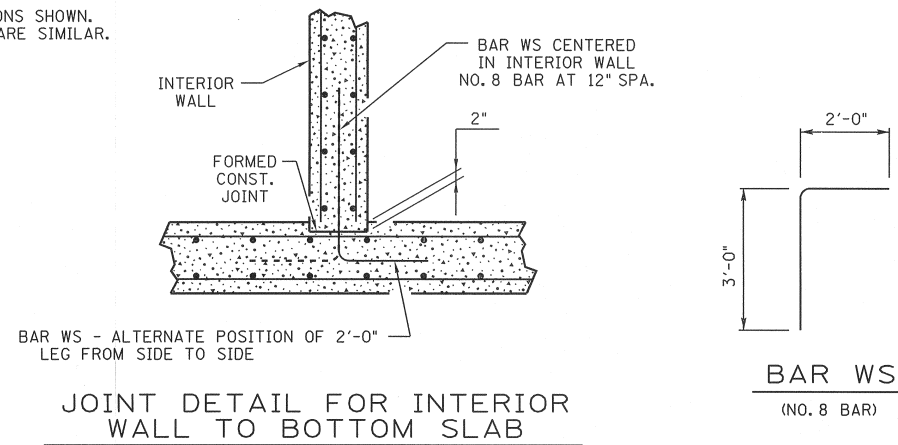
REINFORCING BAR DESIGNATIONS

THE REINFORCING BAR DESIGNATIONS IDENTIFY THE LOCATION AND PLACEMENT OF THE BARS AS FOLLOWS:

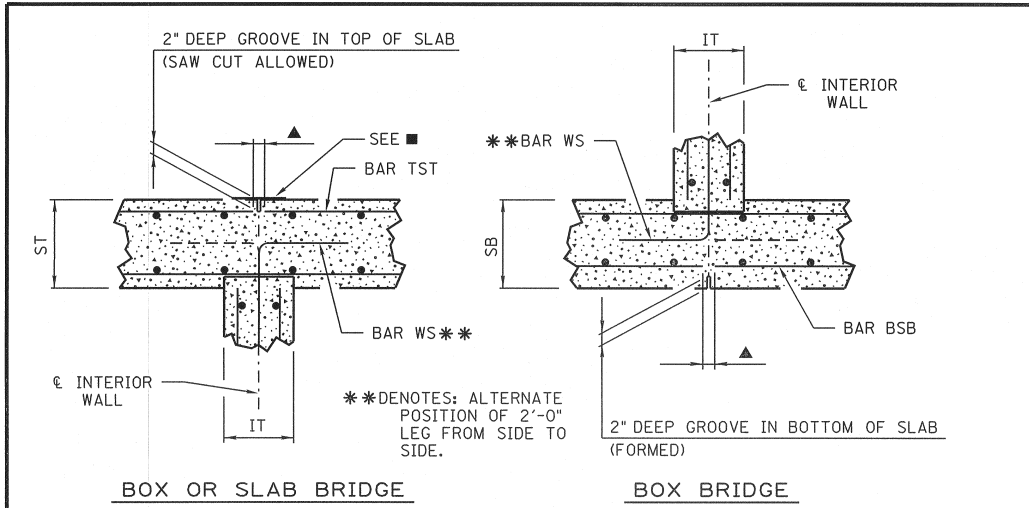
- TST = TOP SLAB, TOP FACE
- TSB = TOP SLAB, BOTTOM FACE
- BST = BOTTOM SLAB, TOP FACE
- BSB = BOTTOM SLAB, BOTTOM FACE
- EWE = EXTERIOR WALL, EXTERIOR FACE
- EWI = EXTERIOR WALL, INTERIOR FACE
- IW = INTERIOR WALL, BOTH FACES
- LNT = LONGITUDINAL BAR
- LND = LONGITUDINAL DISTRIBUTION BAR, TOP SLAB, BOTTOM FACE
- WS = CONNECTOR, WALL TO SLAB
- WF = CONNECTOR, WALL TO FOOTING
- EWf = EXTERIOR WALL FOOTING
- IWf = INTERIOR WALL FOOTING



JOINT DETAIL FOR WALL TO SLAB OR FOOTING

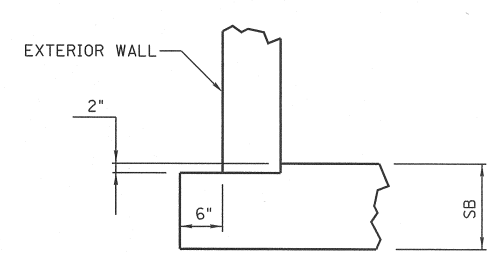


JOINT DETAIL FOR INTERIOR WALL TO BOTTOM SLAB



MOMENT BREAK DETAIL FOR MULTIPLE BARREL BOX & SLAB BRIDGES

NOTE: MANDATORY FOR FILL HEIGHTS GREATER THAN 10 FEET.



ALTERNATE BOTTOM SLAB DETAIL

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS AND DETAILS

STANDARD REINFORCED CONCRETE BRIDGE BOX AND SLAB TYPE

2010

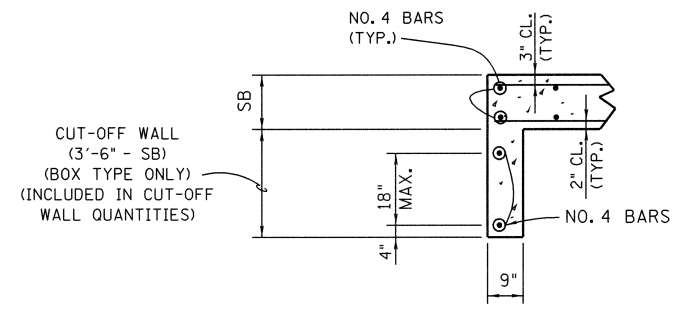
CORRECT *Edward P. Wasserman*  
ENGINEER OF STRUCTURES

DESIGNED BY: CMH / MAH  
 DRAWN BY: DIANE BUSH  
 SUPERVISED BY: RLH / JWP / MAH  
 CHECKED BY:

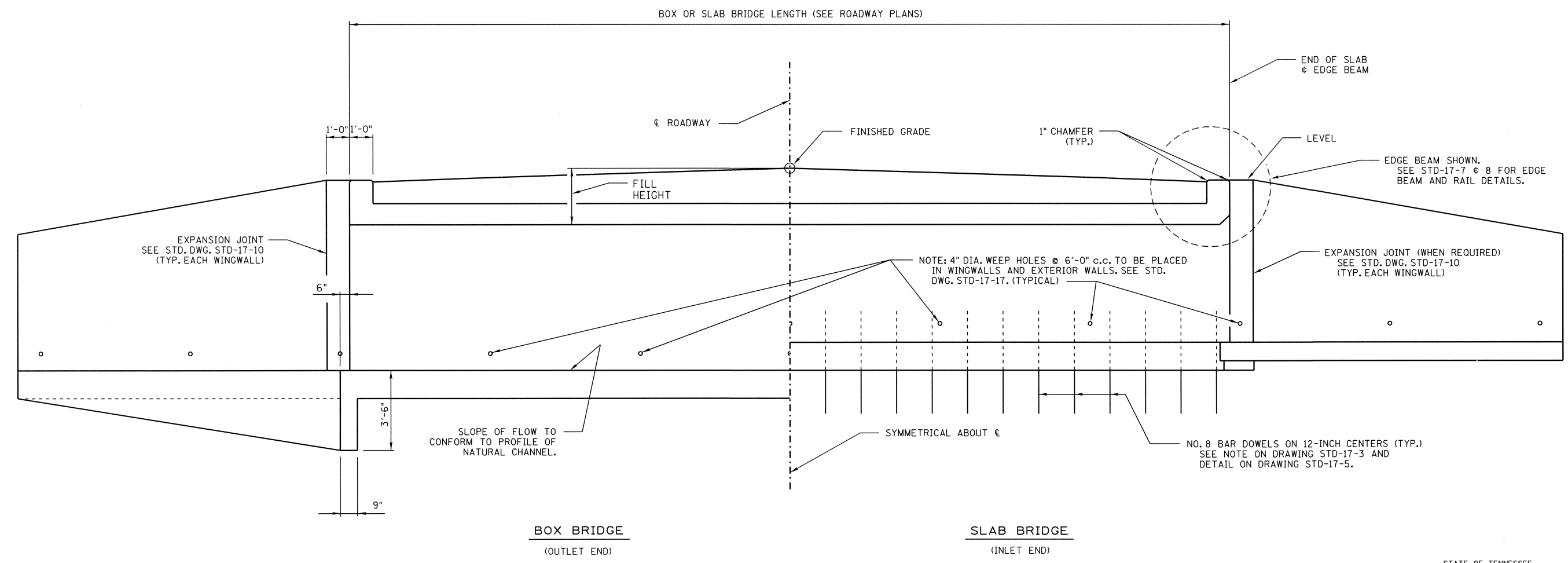
DESIGNED BY: CMH / MAH DATE: 12-09  
 DRAWN BY: DIANE BUSH DATE: 04-10  
 SUPERVISED BY: RLH / JWP / MAH DATE: 12-09  
 CHECKED BY: DATE:

\* NOTE: THE EXCEPTION OCCURS WHEN TOP OR BOTTOM OF SLAB THICKNESS WILL NOT ALLOW 1'-0" PROJECTION. IN THOSE CASES, BARS WS MUST BE TIED TO TOP (TST) OR BOTTOM (BSB) MAT STEEL.

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**CUT-OFF WALL DETAILS**  
 NOTE: WHEN SB EQUALS OR EXCEEDS 3'-6", NO ADDITIONAL CUT-OFF WALL PROJECTION IS REQUIRED.



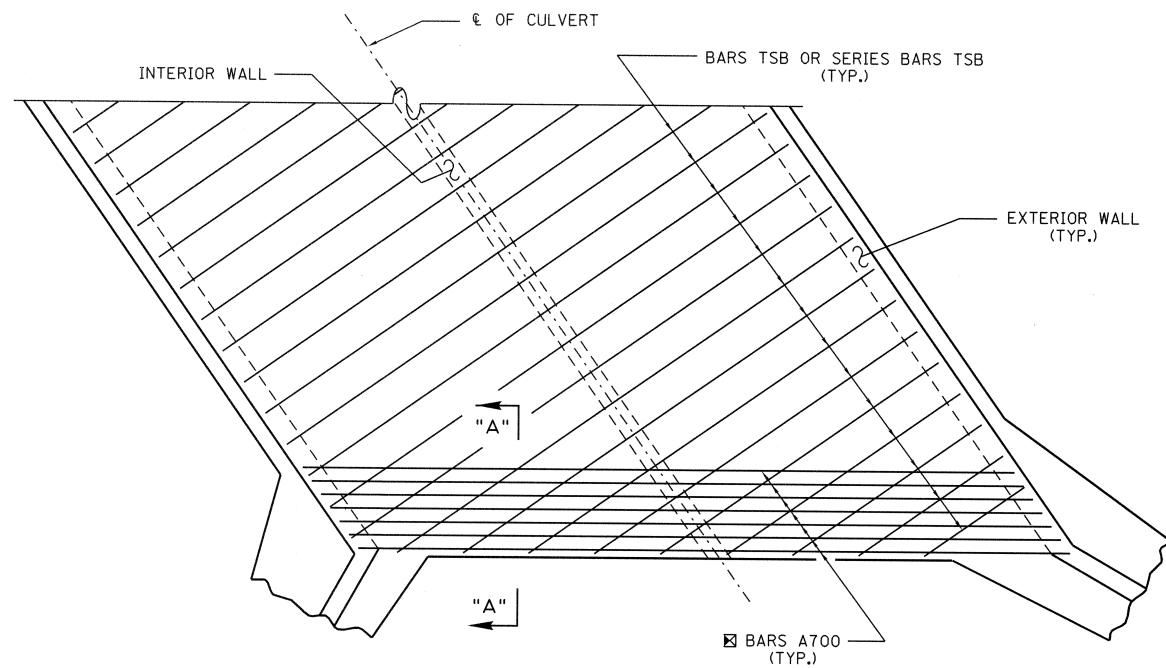
**TYPICAL ELEVATION**  
 ALONG € BRIDGE

STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION  
**TYPICAL ELEVATION**  
 STANDARD REINFORCED  
 CONCRETE BRIDGE  
 BOX AND SLAB TYPE  
 2010

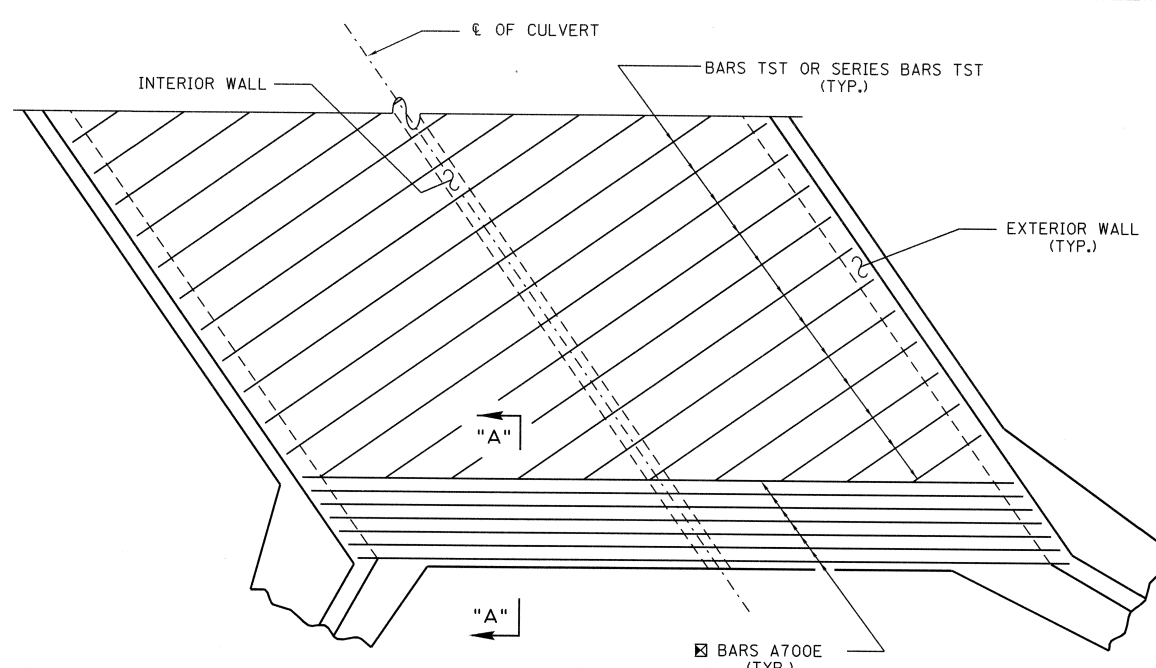
DESIGNED BY CMH / MAH DATE 12-09  
 DRAWN BY DIANE BUSH DATE 04-10  
 SUPERVISED BY RLH / JWP / MAH DATE 12-09  
 CHECKED BY DATE

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 ENGINEER OF STRUCTURES

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**PLAN VIEW**  
(BOTTOM MAT OF STEEL)

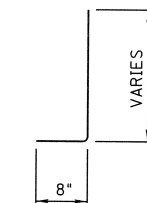


**PLAN VIEW**  
(TOP MAT OF STEEL)

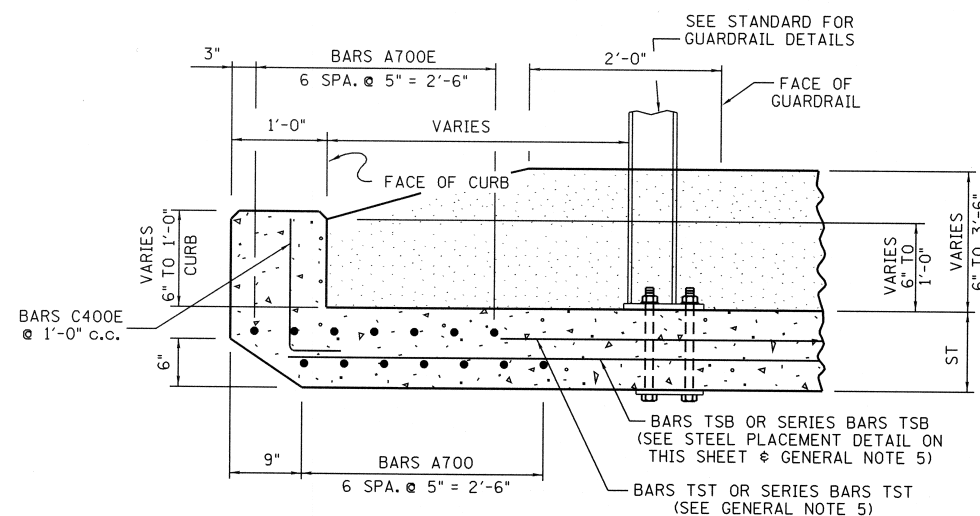
NOTE: BARS LNT OR LND NOT SHOWN.

☒ NOTE: BARS A700E AND BARS A700 SHALL BE TWO SPLICED BARS WHEN BOX WIDTH (BW) IS GREATER THAN 60'-4".

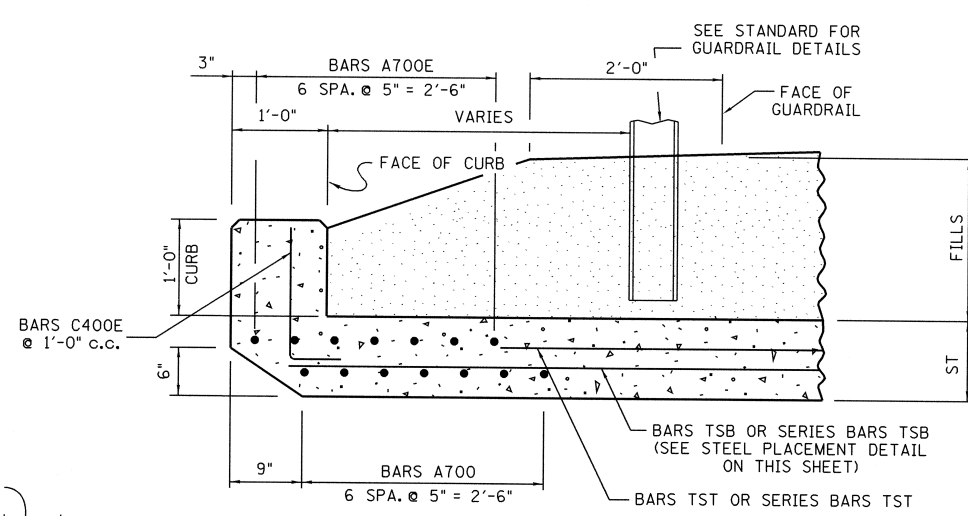
CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



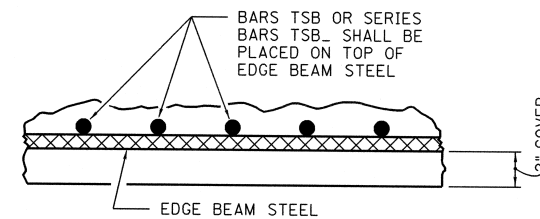
**BARS C400E**



**SECTION "A-A"**  
(INLET END EDGE BEAM)  
(6" TO 3'-6" FILL)



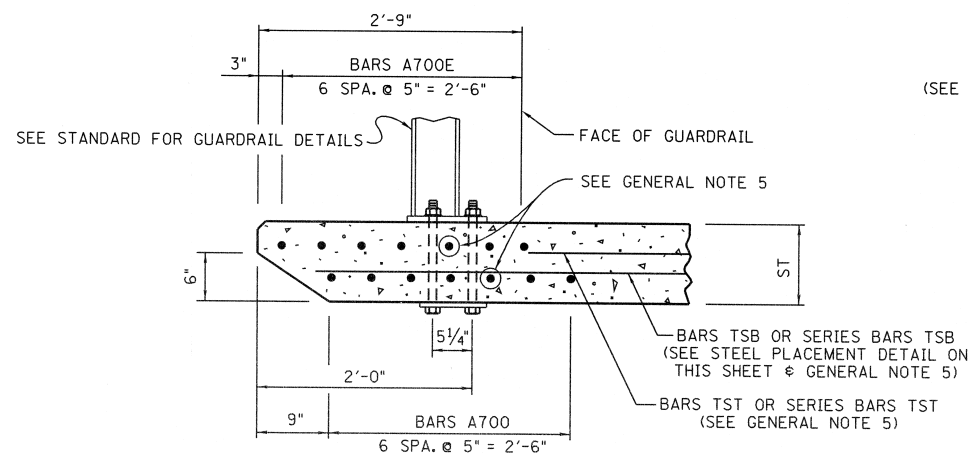
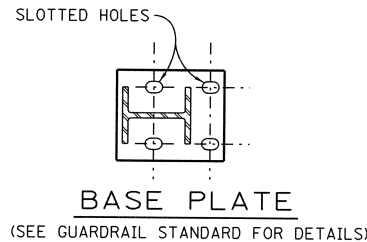
**SECTION "A-A"**  
(INLET END EDGE BEAM)  
(FILLS OVER 3'-6")



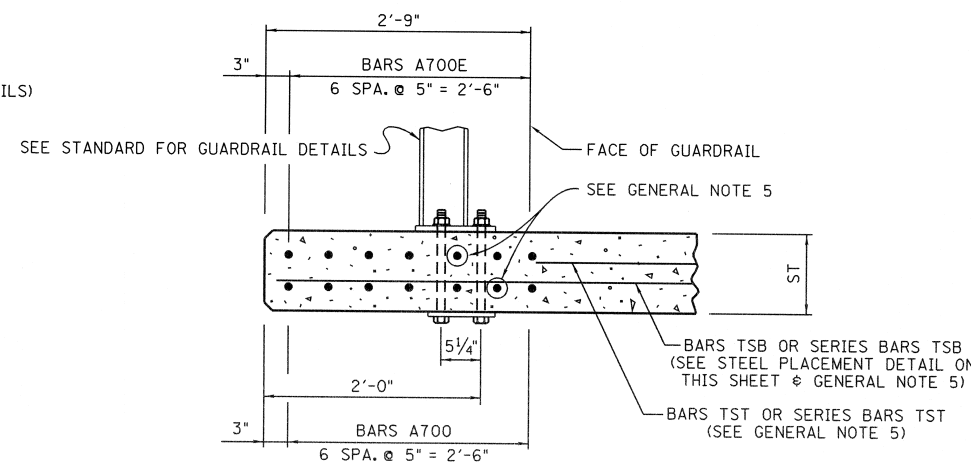
**STEEL PLACEMENT DETAIL**

**GENERAL NOTES**

- NOTE: QUANTITIES WILL BE BASED ON PLANS DIMENSIONS, AS SHOWN ON THE FOLLOWING DRAWINGS: ROADWAY CULVERT SHEETS, THE CONCRETE BOX OR SLAB BRIDGE DRAWINGS DESIGNED FOR A SPECIFIC LOCATION, OR THE STANDARD BOX OR SLAB BRIDGE DRAWINGS.
- NOTE: ALL BARS "A" ARE STRAIGHT BARS.
- NOTE: SKEW ANGLES LESS THAN 45° REQUIRE SPECIAL DESIGN.
- NOTE: WHEN DEPTH OF FILL AT FACE OF GUARDRAIL EXCEEDS 3'-6" DELETE THE USE OF BOLTED BASE PLATES AND DRIVE THE POSTS.
- NOTE: ANY REINFORCING BAR THAT INTERFERES WITH THE FORMED HOLES FOR THE GUARDRAIL ANCHOR BOLTS SHALL BE MOVED HORIZONTALLY TO PROVIDE 1" MINIMUM CLEARANCE TO THE HOLE.



**SECTION "A-A"**  
(INLET END EDGE BEAM)  
(NO FILL)



**SECTION "A-A"**  
(OUTLET END EDGE BEAM)

DESIGNED BY: CMH / MAH DATE: 12-09  
 DRAWN BY: DIANE BUSH DATE: 04-10  
 SUPERVISED BY: RHL / JWP / MAH DATE: 12-09  
 CHECKED BY: DATE:

STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

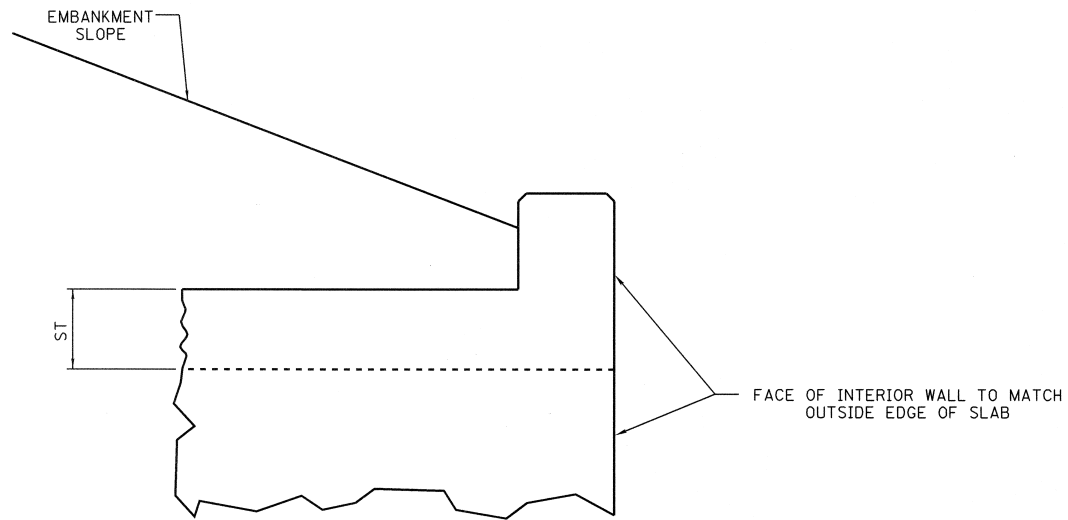
**CURB, RAIL AND  
 EDGE BEAM DETAILS  
 SKEW NOT LESS THAN 45°**

**STANDARD REINFORCED  
 CONCRETE BRIDGE  
 BOX AND SLAB TYPE**

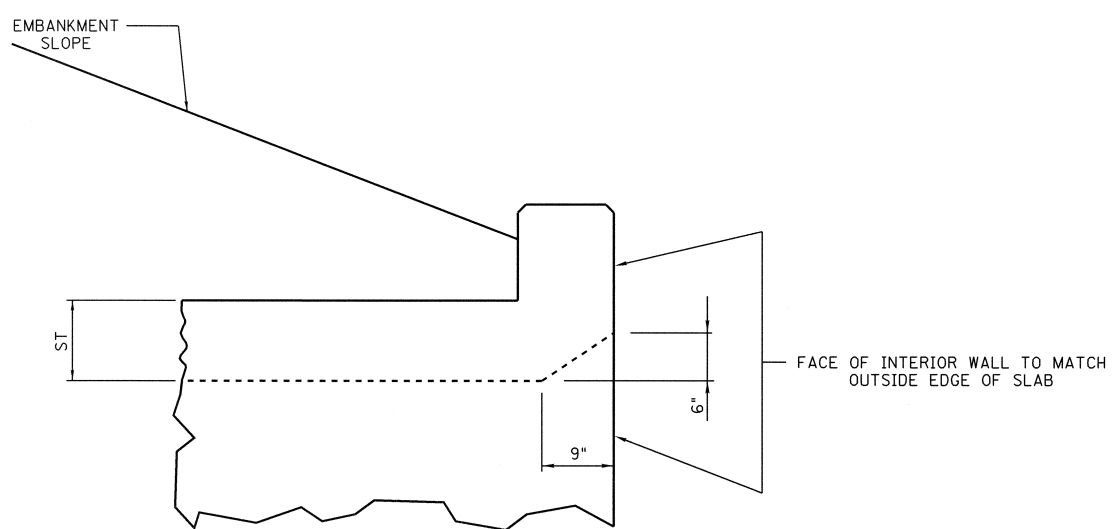
CORRECT *Edward P. Wasserman*  
 ENGINEER OF STRUCTURES

2010

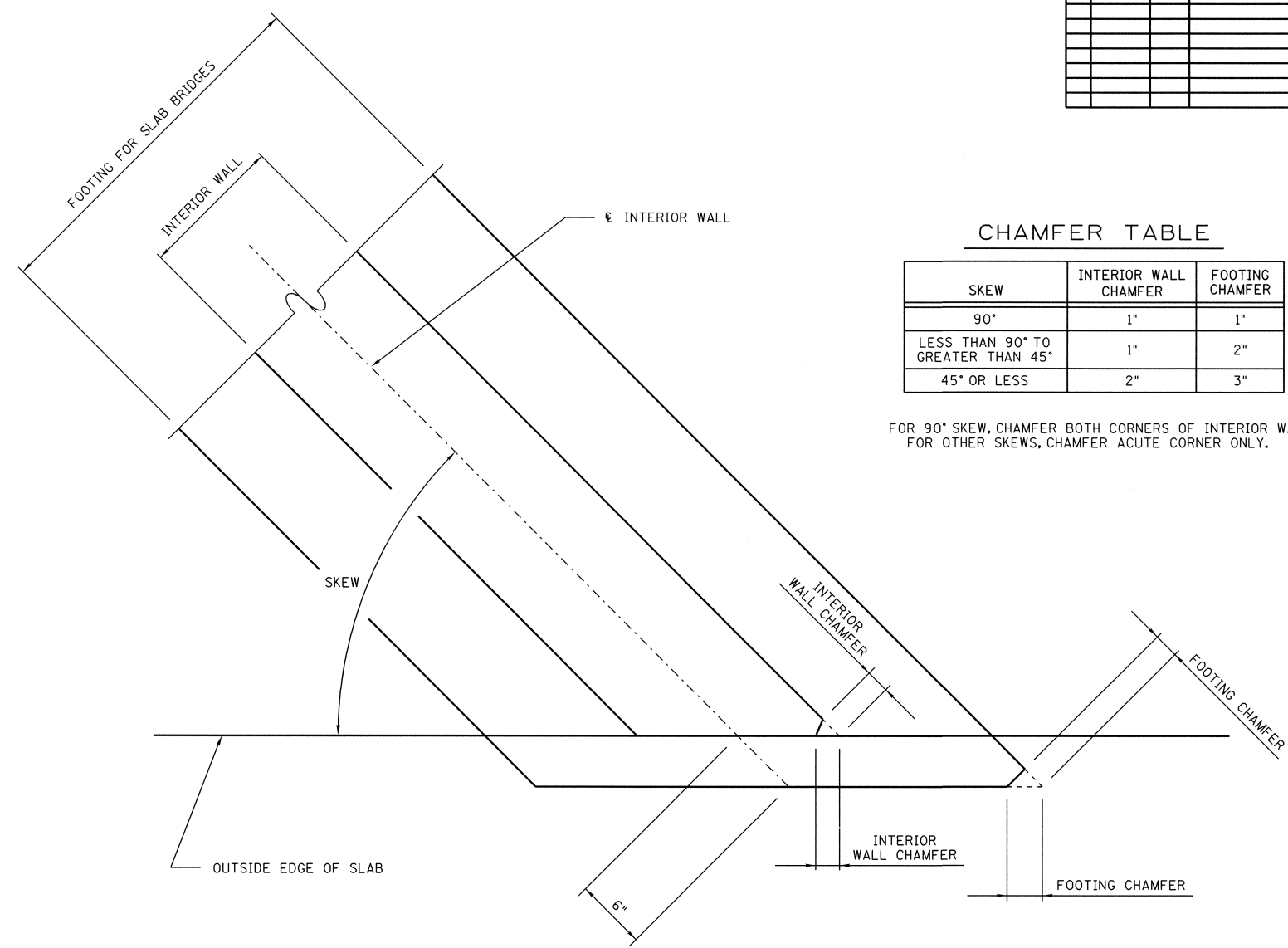
CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



OUTLET END ELEVATION



INLET END ELEVATION



PLAN VIEW OF INTERIOR WALL END TREATMENT

(SLAB BRIDGE SHOWN; BOX BRIDGE SIMILAR)

CHAMFER TABLE

SKEW	INTERIOR WALL CHAMFER	FOOTING CHAMFER
90°	1"	1"
LESS THAN 90° TO GREATER THAN 45°	1"	2"
45° OR LESS	2"	3"

FOR 90° SKEW, CHAMFER BOTH CORNERS OF INTERIOR WALL. FOR OTHER SKEWS, CHAMFER ACUTE CORNER ONLY.

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

INTERIOR WALL END TREATMENTS

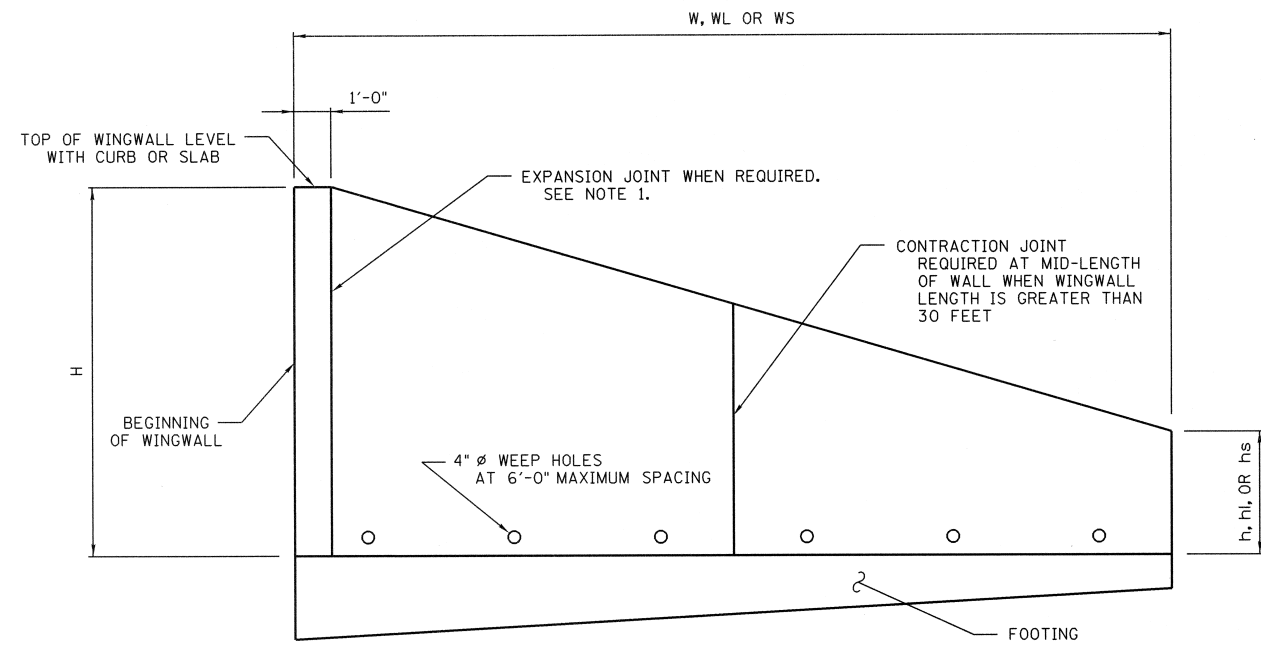
STANDARD REINFORCED CONCRETE BRIDGE  
BOX AND SLAB TYPE

2010

DESIGNED BY CMH / MAH DATE 12-09  
 DRAWN BY DIANE BUSH DATE 04-10  
 SUPERVISED BY RLH / JWP / MAH DATE 12-09  
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ENGINEER OF STRUCTURES

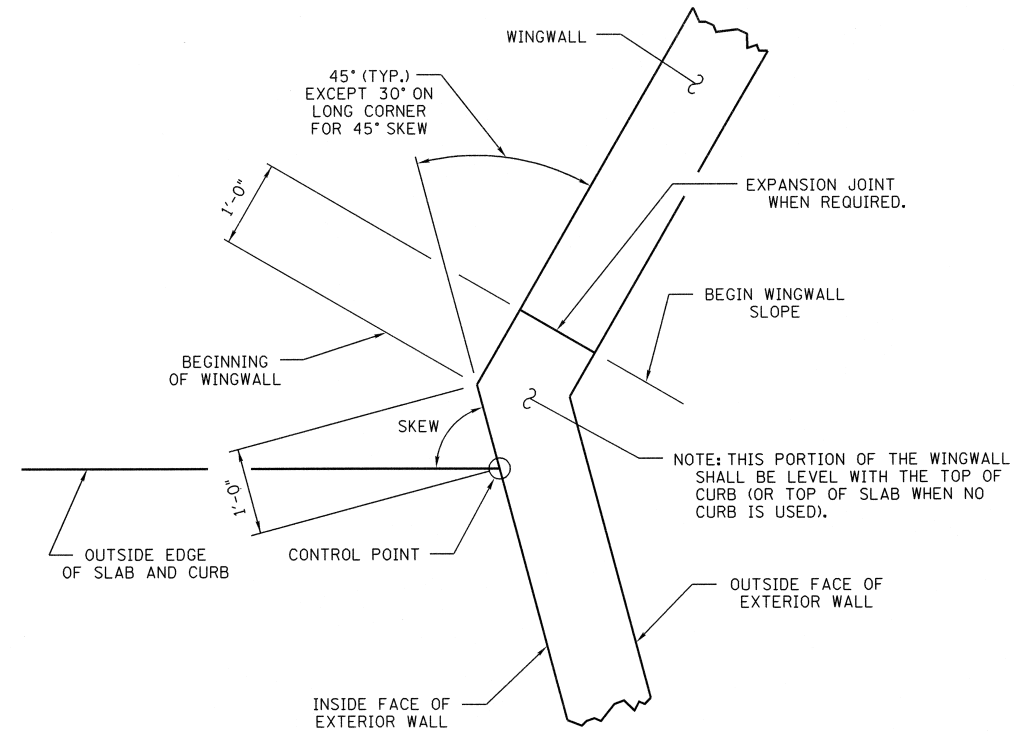




NOTE: SEE TABLES ON STANDARD DRAWINGS STD-17-11 THRU 14 FOR WINGWALL DIMENSIONS

W = WINGWALL LENGTH FOR 90° SKEW  
 WL = LENGTH OF LONG WINGWALL FOR SKEWS OTHER THAN 90°  
 WS = LENGTH OF SHORT WINGWALL FOR SKEWS OTHER THAN 90°  
 H = HEIGHT AT BEGINNING OF WINGWALL  
 h = MIN. HEIGHT OF END OF WINGWALL FOR 90° SKEW  
 h<sub>l</sub> = MIN. HEIGHT OF END OF LONG WINGWALL FOR SKEWS OTHER THAN 90°  
 h<sub>s</sub> = MIN. HEIGHT OF END OF SHORT WINGWALL FOR SKEWS OTHER THAN 90°

ELEVATION VIEW OF WINGWALL

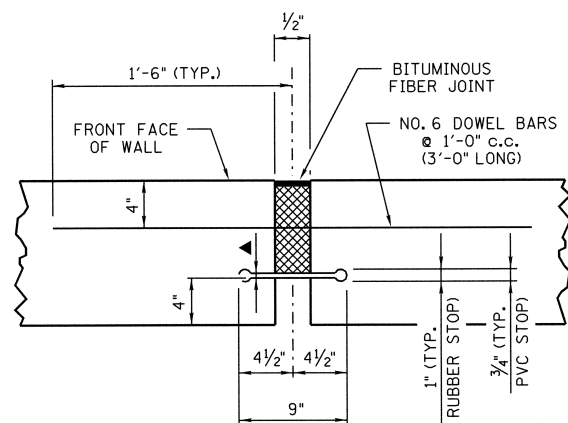
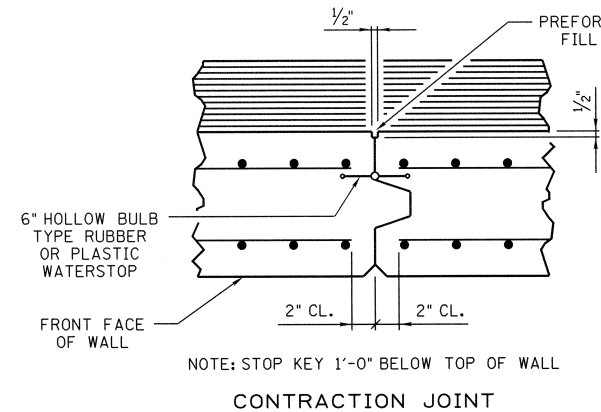


TYPICAL CORNER DETAIL

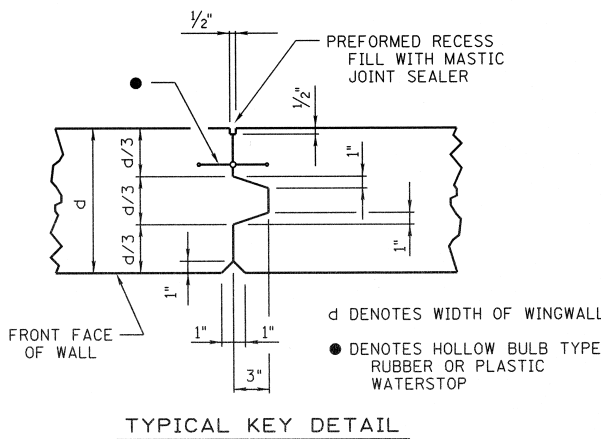
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	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION

NOTES

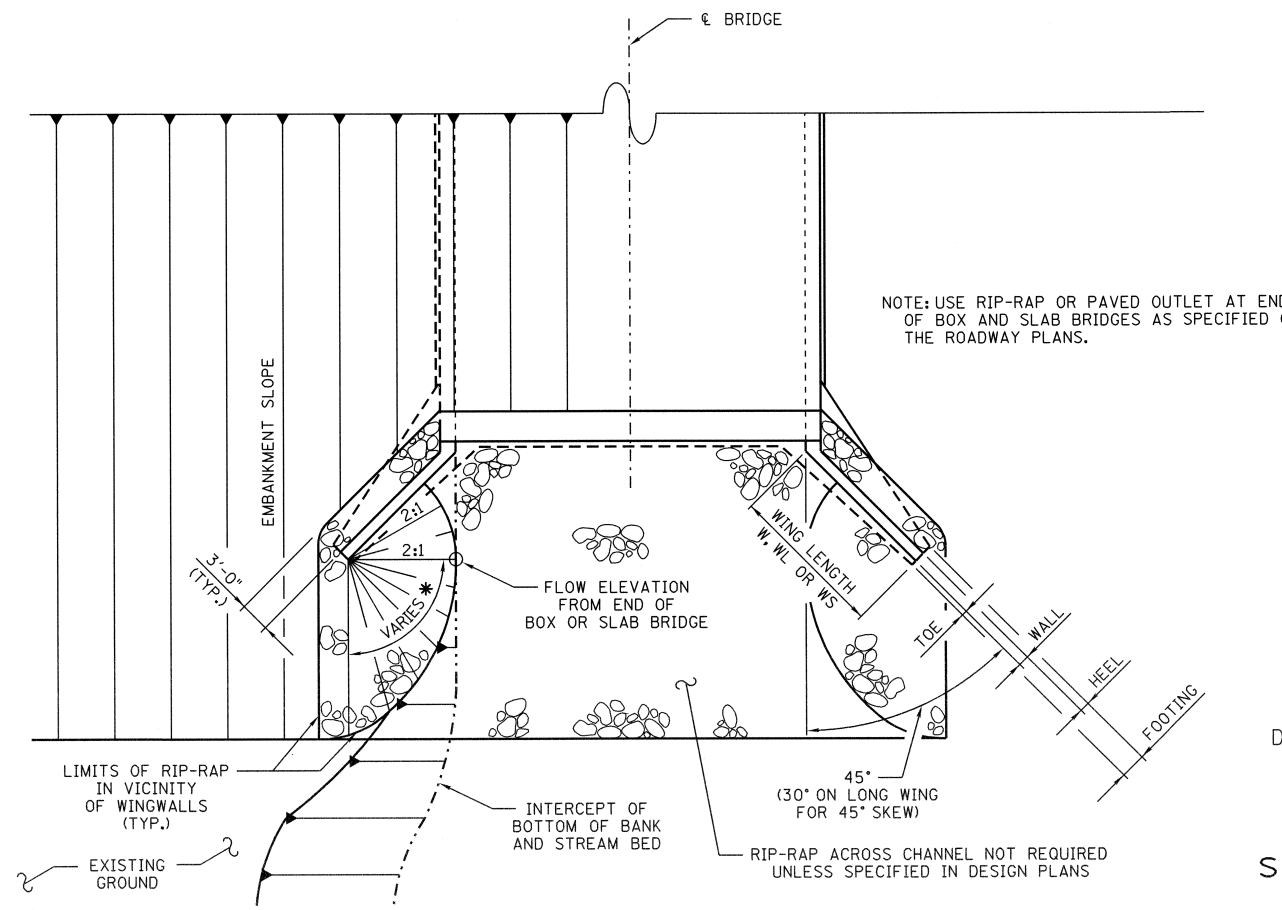
1. WALL JOINTS - AN EXPANSION JOINT IS REQUIRED AT THE LOCATION SHOWN ON THIS DRAWING FOR ALL BOX BRIDGES, AND FOR SLAB BRIDGES WHENEVER THE WINGWALL LENGTH IS GREATER THAN 15 FEET. FOR WINGWALLS GREATER THAN 30 FEET, PLACE A CONTRACTION JOINT AT MID-LENGTH OF THE WALL. IF RUSTICATION GROOVES ARE USED, THE JOINTS SHALL BE SPACED TO CORRESPOND WITH RUSTICATIONS. WATERSTOPS SHALL MEET THE REQUIREMENTS OF SPECIFICATION ARTICLES 604.26 AND 918.11. JOINT MATERIAL SHALL MEET THE REQUIREMENTS OF SPECIFICATIONS SECTION 905. FOOTING AND FOOTING REINFORCEMENT SHALL BE CONTINUOUS.



THE EXPANSION JOINT SHALL BE USED IN THE WALL ONLY AND NOT CARRIED THROUGH THE FOOTING. NO REINFORCEMENT SHALL PASS THROUGH THE JOINT. ONE END OF THE DOWELS SHALL BE WRAPPED IN A LAYER OF TARPAPER WITH A TARPAPER CAP OVER THE END. THE COST OF THE BITUMINOUS FIBER AND DOWEL SHALL BE INCLUDED IN THE UNIT PRICE BID FOR CLASS A CONCRETE.



WALL JOINT DETAILS



PLAN VIEW OF WINGWALLS

(90° SKEW SHOWN; OTHER SKEWS SIMILAR)

STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

TYPICAL WINGWALL  
 DETAILS AND NOTES

STANDARD REINFORCED  
 CONCRETE BRIDGE  
 BOX AND SLAB TYPE

2010

CORRECT *Edward P. Wasserman*  
 ENGINEER OF STRUCTURES

90° SKEW

2:1 SLOPE				
H	W	h	CONCRETE (C.Y.)	REINF. STEEL (LBS.)
4	5.00	1.75	3.3	630
4.5	5.75	2.00	4.1	694
5	6.50	2.25	5.3	781
5.5	7.25	2.50	6.3	914
6	8.00	2.75	7.4	1,014
6.5	8.50	3.00	8.4	1,069
7	9.25	3.25	10.1	1,367
7.5	10.00	3.50	11.5	1,486
8	10.75	3.75	13.0	1,607
8.5	11.50	4.00	14.6	1,749
9	12.25	4.25	16.9	2,576
9.5	12.75	4.50	18.4	2,639
10	13.50	4.75	20.4	2,875
10.5	14.25	5.00	23.2	3,091
11	15.00	5.25	26.3	3,494
11.5	15.75	5.50	30.3	4,328
12	16.50	5.75	32.9	4,544
12.5	17.00	6.00	35.1	4,662
13	17.75	6.25	39.4	5,610
13.5	18.50	6.50	42.4	6,003
14	19.25	6.75	45.5	6,260
14.5	20.00	7.00	49.9	6,741
15	20.75	7.25	56.4	7,352
15.5	21.25	7.50	59.4	8,039
16	22.00	7.75	63.2	8,506
16.5	22.75	8.00	67.2	9,812
17	23.50	8.25	73.7	10,799
17.5	24.25	8.50	78.1	10,884
18	24.75	8.75	81.7	11,209
18.5	25.50	9.00	88.3	11,733
19	26.25	9.25	97.7	12,981
19.5	27.00	9.50	102.8	14,737
20	27.75	9.75	108.1	15,265
20.5	28.50	10.00	113.5	15,719
21	29.00	10.25	126.0	17,262

3:1 SLOPE				
H	W	h	CONCRETE (C.Y.)	REINF. STEEL (LBS.)
4	6.25	2.25	4.3	675
4.5	7.25	2.50	5.4	744
5	8.00	3.00	6.9	849
5.5	9.00	3.25	8.3	1,014
6	9.75	3.50	9.5	1,116
6.5	10.50	3.75	10.8	1,180
7	11.50	4.00	13.1	1,520
7.5	12.25	4.50	14.9	1,624
8	13.25	4.75	16.9	1,754
8.5	14.00	5.00	19.5	1,974
9	14.75	5.25	22.2	2,962
9.5	15.75	5.50	24.7	3,082
10	16.50	6.00	27.3	3,342
10.5	17.50	6.25	30.1	3,504
11	18.25	6.50	33.6	3,928
11.5	19.00	6.75	37.5	4,786
12	20.00	7.00	41.9	5,216
12.5	20.75	7.50	45.4	5,394
13	21.75	7.75	52.0	6,412
13.5	22.50	8.00	55.4	6,870
14	23.25	8.25	59.0	7,136
14.5	24.25	8.50	63.3	7,589
15	25.00	9.00	73.3	8,368
15.5	25.75	9.25	77.5	9,299
16	26.75	9.50	82.6	9,820
16.5	27.50	9.75	87.1	11,451
17	28.50	10.00	95.7	12,593
17.5	29.25	10.50	101.2	12,502
18	30.00	10.75	106.4	12,936
18.5	31.00	11.00	118.0	13,630
19	31.75	11.25	129.5	14,977
19.5	32.75	11.50	136.5	17,020
20	33.50	12.00	143.3	17,579
20.5	34.25	12.25	149.6	18,066
21	35.25	12.50	167.3	19,857

4:1 SLOPE				
H	W	h	CONCRETE (C.Y.)	REINF. STEEL (LBS.)
4	7.25	2.50	5.1	716
4.5	8.25	3.00	6.4	786
5	9.00	3.25	7.9	896
5.5	10.00	3.50	9.4	1,067
6	11.00	4.00	11.1	1,176
6.5	12.00	4.25	12.8	1,265
7	12.75	4.50	14.9	1,611
7.5	13.75	5.00	17.9	1,779
8	14.75	5.25	20.1	1,915
8.5	15.75	5.50	22.4	2,119
9	16.50	6.00	25.7	3,136
9.5	17.50	6.25	28.4	3,257
10	18.50	6.50	31.3	3,584
10.5	19.50	7.00	35.5	3,869
11	20.50	7.25	39.8	4,321
11.5	21.25	7.50	44.2	5,262
12	22.25	8.00	48.3	5,554
12.5	23.25	8.25	49.5	5,602
13	24.25	8.50	59.3	6,791
13.5	25.00	9.00	65.2	7,533
14	26.00	9.25	69.7	7,870
14.5	27.00	9.50	74.5	8,299
15	28.00	10.00	86.4	9,193

6:1 SLOPE				
H	W	h	CONCRETE (C.Y.)	REINF. STEEL (LBS.)
4	8.25	3.00	6.1	757
4.5	9.25	3.25	7.3	828
5	10.50	3.75	9.6	965
5.5	11.50	4.00	11.1	1,146
6	12.50	4.50	13.0	1,256
6.5	13.50	4.75	14.8	1,346
7	14.50	5.25	18.0	1,753

CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION

NOTE: QUANTITIES ON THIS SHEET ARE ESTIMATED TOTALS FOR ALL FOUR WINGWALLS.

NOTE: ADDITIONAL CONCRETE AND REINFORCEMENT QUANTITIES FOR BOX CULVERT CUT-OFF WALL SHALL BE ADJUSTED BASED ON AS-BUILT DIMENSIONS.

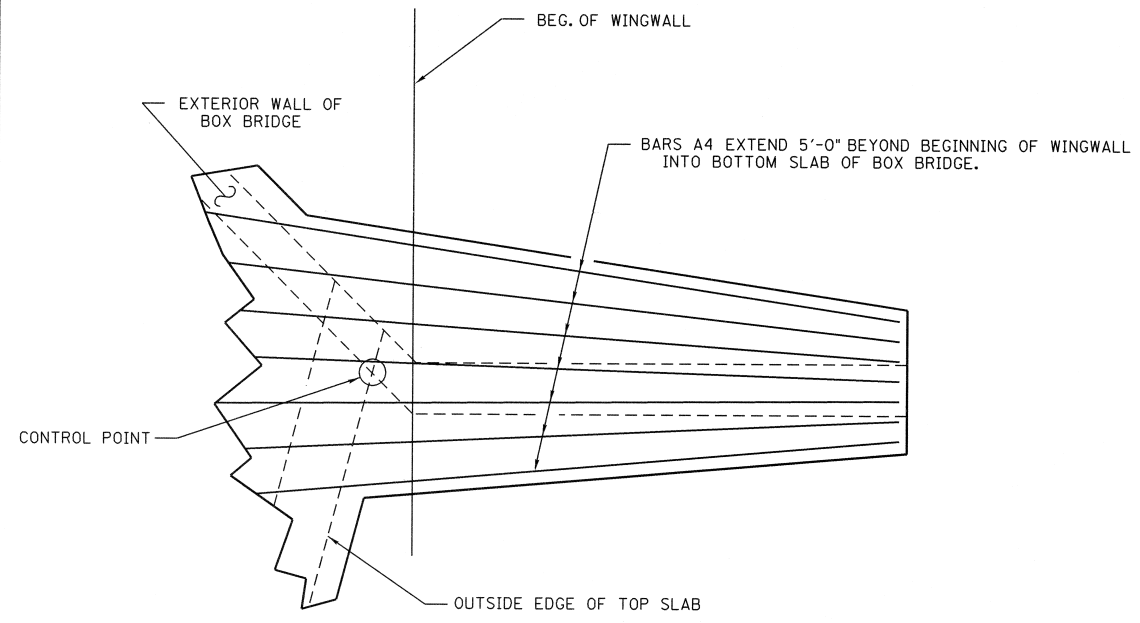
STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION  
**WINGWALL DIMENSIONS  
 AND QUANTITIES**  
 STANDARD REINFORCED  
 CONCRETE BRIDGE  
 BOX AND SLAB TYPE  
 2010

DESIGNED BY CMH / MAH DATE 12-09  
 DRAWN BY DIANE BUSH DATE 04-10  
 SUPERVISED BY RLH / JWP / MAH DATE 12-09  
 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

CORRECT Edward P. Wasserman  
ENGINEER OF STRUCTURES

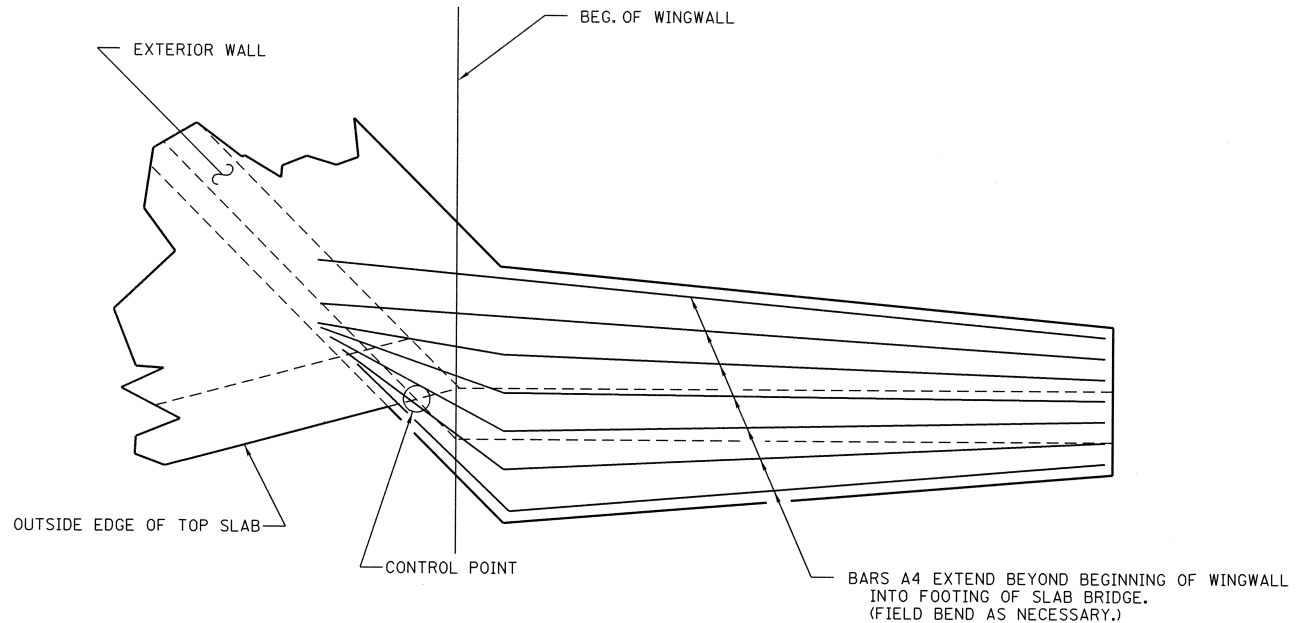
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CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



PLAN OF WING FOOTING DETAIL FOR CONCRETE BOX BRIDGE

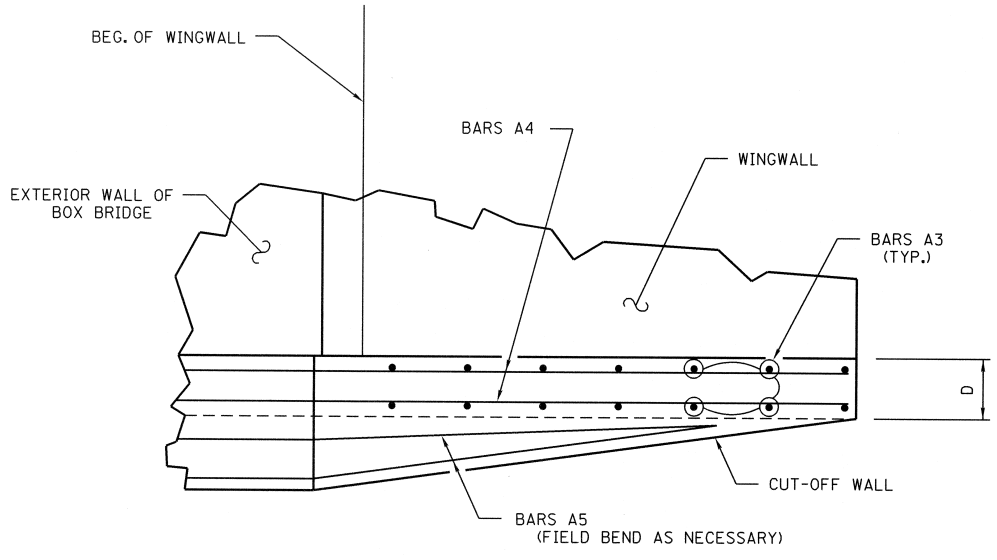
NOTE: FOR CROSS SECTION OF WINGWALL & FOOTING, SEE "SECTION" ON SHEET STD-17-15.



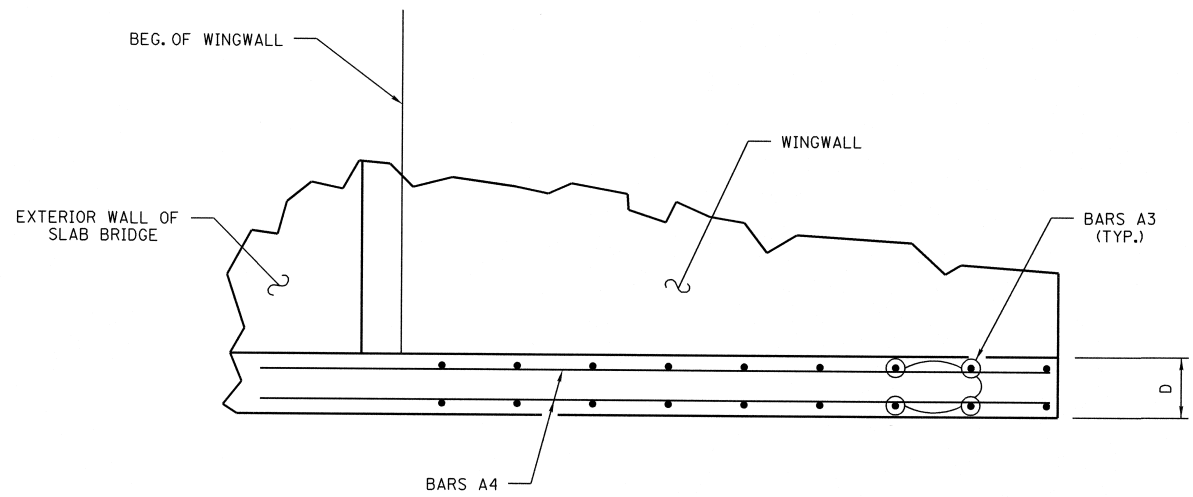
PLAN OF WING FOOTING DETAIL FOR SLAB TYPE BRIDGE

NOTE: FOR CROSS SECTION OF WINGWALL & FOOTING, SEE "SECTION" ON SHEET STD-17-15.

NOTE: FOR ADDITIONAL INFORMATION ABOUT FOOTINGS & WINGWALLS, SEE TABLE OF WALL DIMENSIONS, REINFORCING STEEL SCHEDULE AND QUANTITIES ON DWG. STD-17-15.



ELEVATION OF WING FOOTING DETAIL FOR CONCRETE BOX BRIDGE



ELEVATION OF WING FOOTING DETAIL FOR SLAB TYPE BRIDGE

STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION  
**WINGWALL DESIGN SECTIONS**  
 STANDARD REINFORCED CONCRETE BRIDGE  
 BOX AND SLAB TYPE

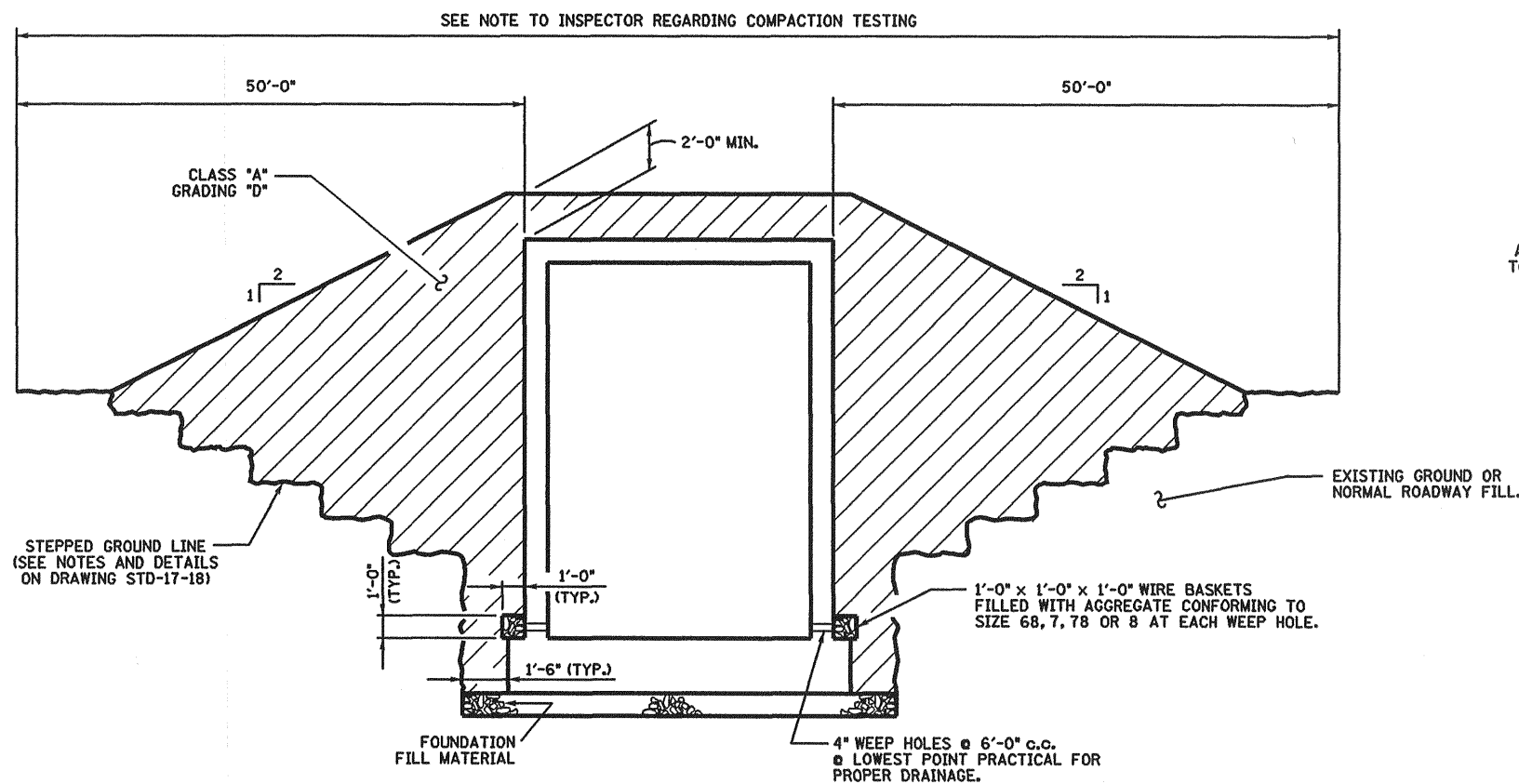
2010

DESIGNED BY: CMH / MAH      DATE: 12-09  
 DRAWN BY: DIANE BUSH      DATE: 04-10  
 SUPERVISED BY: R/LH / JWP / MAH      DATE: 12-09  
 CHECKED BY:      DATE:     

CORRECT *Edward P. Wasserman*  
 ENGINEER OF STRUCTURES

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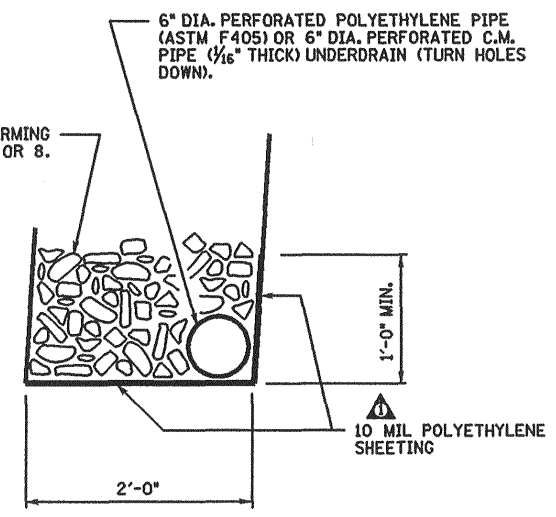
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION
1	6-1-11	JHW	REVISED SHEETING THICKNESS.



**BACKFILL PLACEMENT**

(BOX CULVERT SHOWN; SLAB BRIDGES SIMILAR)  
 NOTE: CLASS "A" GRADING "D" LIMITS ARE TYPICAL FOR BOX CULVERT OR BRIDGE AND WINGWALLS.

NOTE TO INSPECTOR: SEE MATERIALS AND TESTS SAMPLING AND TESTING SCHEDULE FOR FREQUENCY OF COMPACTION TESTING OF EMBANKMENT AND BACKFILL MATERIAL. ALSO, NOTE 1.

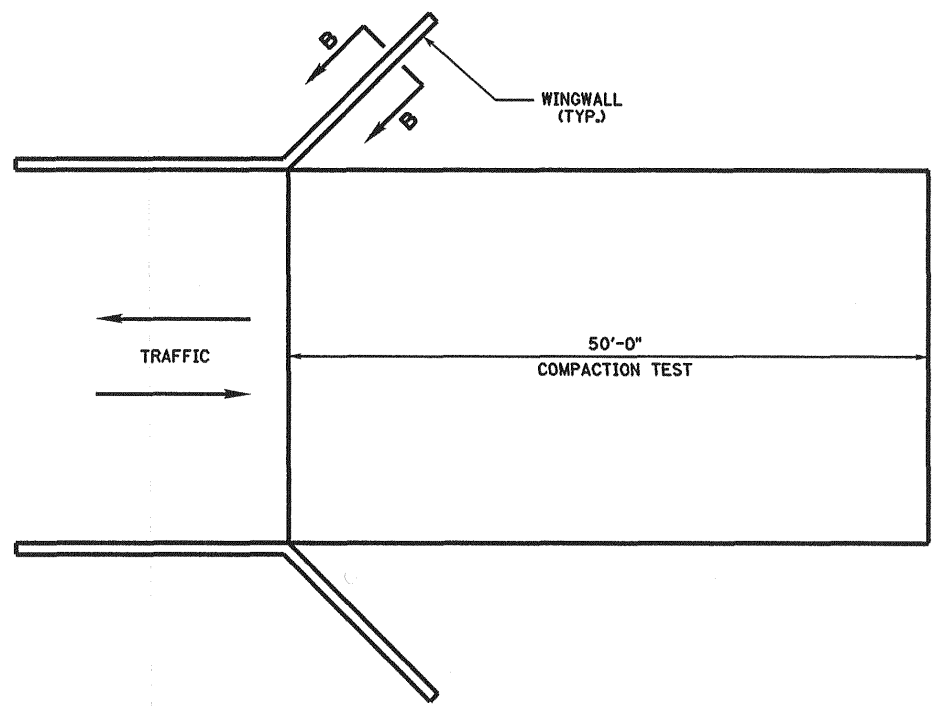


**DETAIL A**

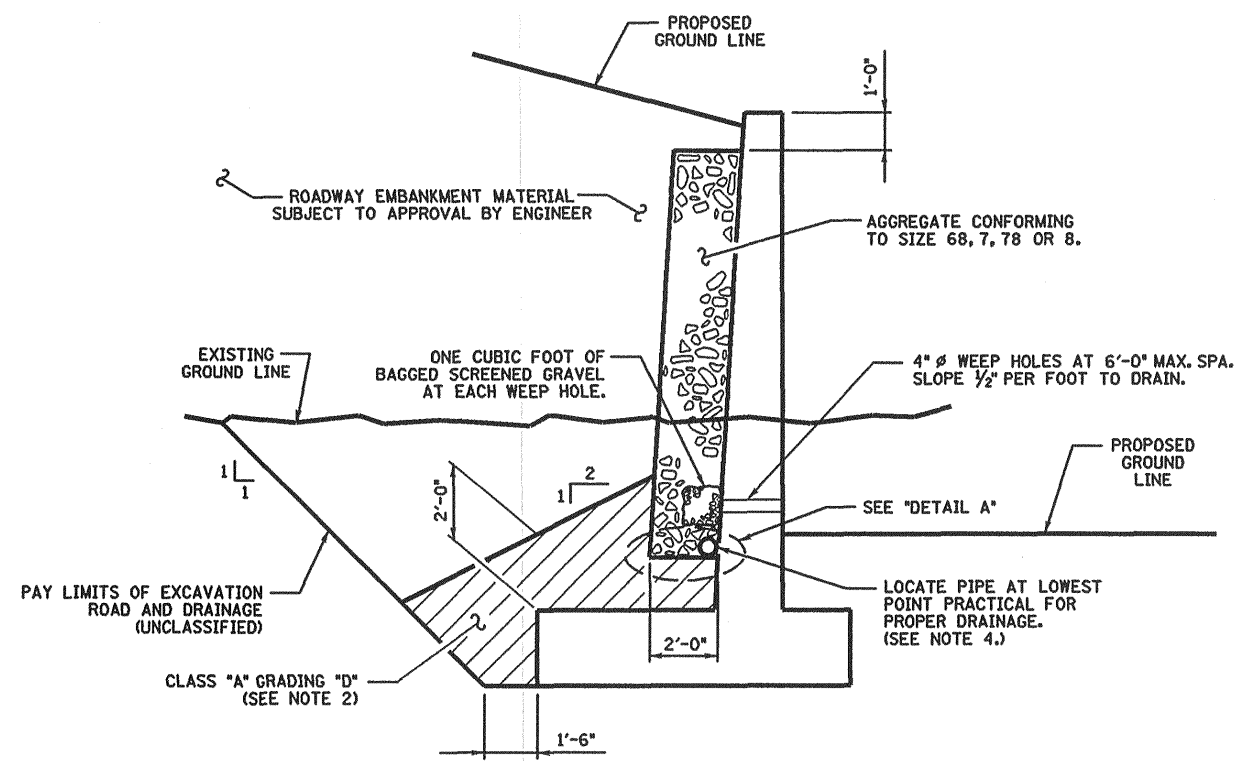
**NOTES**

- BACKFILLING: UNLESS OTHERWISE SPECIFIED OR DIRECTED, THE CONTRACTOR SHALL BACKFILL BEHIND EXTERIOR WALLS AND WINGWALLS OF BOX AND SLAB TYPE BRIDGES AND CULVERTS AS SOON AS THE FOLLOWING CONDITIONS ARE MET:
  - CONCRETE SURFACES AGAINST WHICH BACKFILL WILL BE PLACED HAVE BEEN GIVEN A CLASS 1 FINISH AS SPECIFIED IN SUBSECTION 604.21.
  - REPRESENTATIVE SPECIMENS OF THE CONCRETE IN THE STRUCTURE SECTION OR UNIT, CURED BY THE METHODS AND IN THE MANNER THAT THE CONCRETE WHICH THE TEST SPECIMENS REPRESENT IS CURED, ATTAIN A COMPRESSIVE STRENGTH OF 3000 PSI.
  - THE CONCRETE SHALL HAVE BEEN PLACED A MINIMUM OF 7 DAYS, NOT COUNTING THE DAYS OF TWENTY-FOUR HOURS EACH IN WHICH THE TEMPERATURE FALLS BELOW 40° F OR 21 CALENDAR DAYS WHICHEVER OCCURS FIRST.

THE PLACEMENT OF BACKFILL AND EMBANKMENT SHALL BE IN ACCORDANCE WITH SUBSECTION 204.11 AND SUBSECTION 205.04, RESPECTIVELY, AND AS SPECIFIED ON THE PLANS.
- IN LIEU OF THE CLASS "A" GRADING "D" MATERIAL SHOWN, CLASS "B" GRADING "C" OR "D" MAY BE USED.
- BACKFILL: BACKFILLING OF BOX AND SLAB BRIDGES AND WINGWALLS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 204.11 OF THE STANDARD SPECIFICATIONS. THE REQUIREMENTS FOR STEPPING OF BOUNDARY SLOPES TO PREVENT WEDGE ACTION, FOR PROPER LAYERING AND COMPACTING OF BACKFILL, AND FOR MAINTAINING (AT ALL TIMES) EQUAL HEIGHTS OF BACKFILL AGAINST EXTERIOR WALLS OF BOX AND SLAB BRIDGES SHALL BE STRICTLY ENFORCED. SEE STANDARD STD-17-18 FOR OTHER NOTES AND DETAILS.
- LOCATE PIPE AT LOWEST POINT PRACTICAL FOR PROPER DRAINAGE WITH SLOPE PARALLEL TO ABUTMENT BEAM OR RETAINING WALL (1/8" PER FOOT MINIMUM). INSTALL PIPE AND 1'-0" OF COVER AS SOON AS POSSIBLE AFTER FORMING WALL.
- WEEP HOLES SHALL BE PROVIDED AT A SPACING NOT TO EXCEED 6 FEET IN THE WINGWALLS AND 6 FEET IN THE BOX OR SLAB BRIDGE EXTERIOR WALLS.



**PLAN OF APPROACH ROADWAY AND CULVERT**



**WINGWALL SECTION "B-B"**

STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION  
**BACKFILL AND DRAINAGE DETAILS**

**STANDARD REINFORCED CONCRETE BRIDGE BOX AND SLAB TYPE**

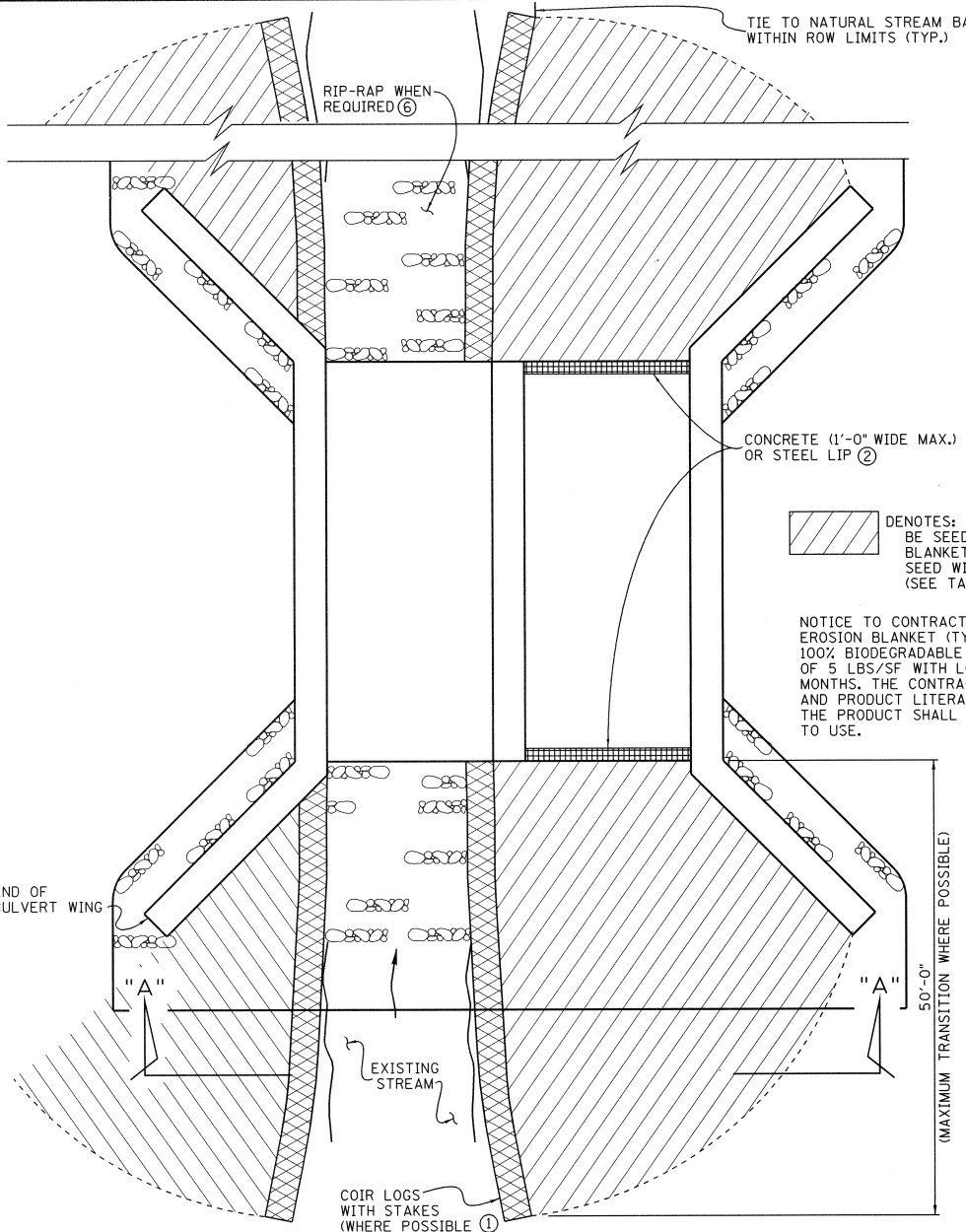
2010

CORRECT *Edward P. Wasserman*  
 ENGINEER OF STRUCTURES

DESIGNED BY: CMH / MAH DATE: 12-09  
 DRAWN BY: DIANE BUSH DATE: 04-10  
 SUPERVISED BY: RLH / JWP / MAH DATE: 12-09  
 CHECKED BY: DATE:

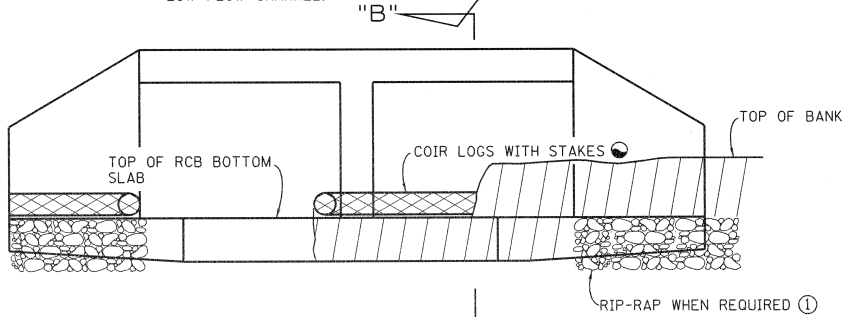






**PLAN**  
**MULTI-BARREL CULVERT**

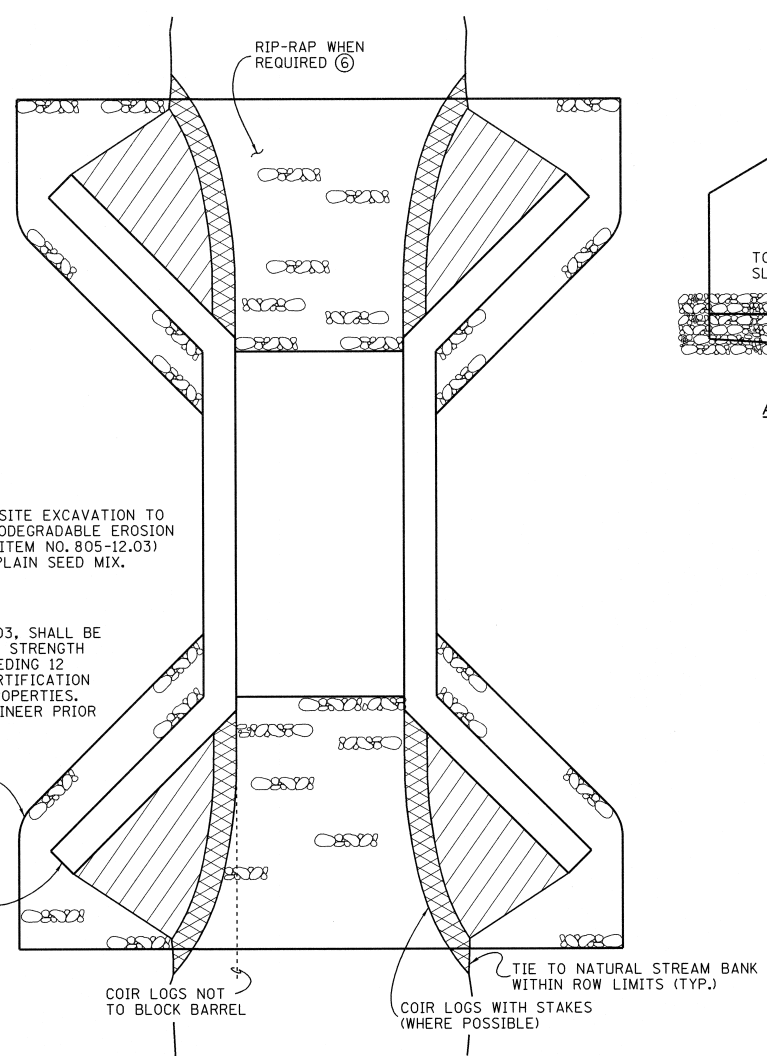
- 1) ONE BARREL OF THE CULVERT IS TO BE ORIENTED INLINE WITH THE LOW FLOW CHANNEL.
- 2) COIR LOGS WITH STAKES ARE TO BE USED TO DIRECT FLOW INTO BARREL THAT IS INLINE WITH LOW FLOW CHANNEL.



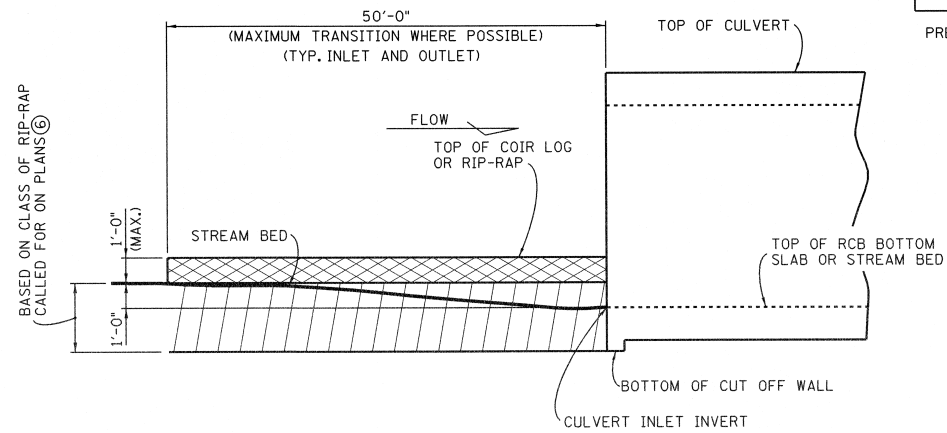
**SECTION "B"- "B"**

DESIGNED BY KEN ELROD DATE 12-09  
 DRAWN BY K. FRANKENFELD (MOB) DATE 04-10  
 SUPERVISED BY KEN ELROD DATE 12-09  
 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

ITEM NO. 209-06.02 UNLESS OTHERWISE SPECIFIED BY DESIGNER.

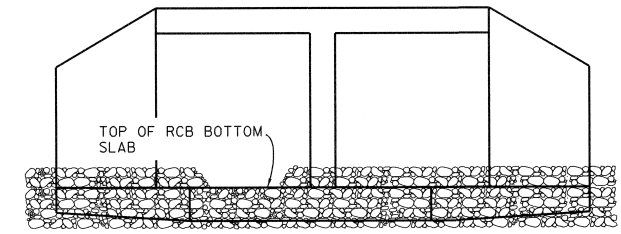


**PLAN**  
**SINGLE BARREL CULVERT**



**SECTION "B"- "B"**

NOTE: 90° STRUCTURE SHOWN, STRUCTURE SKEW MAY VARY



**ALTERNATE SECTION "A"- "A" 1**  
(RIP-RAP ITEM NO. 709-05.XX)

**GENERAL NOTES:**

- 1) ALTERNATE IS TO FORM ENTIRE CROSS-SECTION WITH GABIONS OR RIP-RAP APPROPRIATELY SIZED FOR VELOCITY WITH TOP OF RIP-RAP LAYER NOT TO EXCEED 2'-0" ABOVE TOP OF BOTTOM SLAB OR SIGNIFICANTLY REDUCE BARREL OPENING.
- 2) CONCRETE OR STEEL LIPS IN BARREL MAY BE USED AS AN ALTERNATIVE TO THE LOW FLOW CONSTRUCTION, WITH APPROVAL OF DESIGNER. COST TO BE INCLUDED IN ITEM 604-02.01.
- 3) WHEN RIP-RAP IS SPECIFIED FROM WING TIP TO WING TIP, LOW FLOW CHANNEL CONSTRUCTION IS TO BE FORMED BY RIP-RAP AS IN SECTION "A"- "A".
- 4) WHERE BEDROCK OR SLAB CULVERT IS USED, RIP-RAP SHOULD BE USED TO FORM LOW FLOW CHANNEL DIVERSION. SEE ALTERNATE SECTION "A"- "A" ABOVE.
- 5) THIS DRAWING IS TO BE CALLED FOR BY THE ENVIRONMENTAL DIVISION.
- 6) RIP-RAP PLACED IN THE STREAM CHANNEL SHALL BE COUNTERSUNK AND PLACED AT GRADE WITH THE EXISTING STREAM SUBSTRATE WITH EXCEPTION OF NOTE 1 AND SHALL MIMIC THE EXISTING CHANNEL CHARACTERISTICS.
- 7) LOW FLOW CHANNEL CONSTRUCTION SHALL NOT BEGIN UNTIL CULVERT BARRELS AND WINGS ARE COMPLETE.

**RIPARIAN ZONE/FLOODPLAIN SEED MIX:**  
FOR STABILIZATION OF CHANNEL DIVERSION FILL AREAS FOLLOWING CONSTRUCTION

RIPARIAN ZONE/FLOODPLAIN SEED MIX: ITEM NO. (A SPECIAL PAY ITEM WILL BE REQUIRED)

COVER CROP SEED MIX					
SCIENTIFIC NAME	COMMON NAME	SEEDING RATE		QUANTITY, BY WEIGHT	OVERALL QUANTITY
		POUNDS/ACRE	POUNDS/1,000 s.f.		
TRITICUM AESTIVUM	WINTER WHEAT	10.0	0.23	50%	15.4%
SECALE CEREALE	CEREAL RYE	10.0	0.23	50%	15.4%
<b>COVER CROP TOTALS</b>		<b>20.0</b>	<b>0.46</b>	<b>100%</b>	

GRASS SEED MIX					
SCIENTIFIC NAME	COMMON NAME	SEEDING RATE		QUANTITY, BY WEIGHT	OVERALL QUANTITY
		POUNDS/ACRE	POUNDS/1,000 s.f.		
ENCHINOCHLOA MURICATA	BARNYARD GRASS	10.0	0.23	22%	15.4%
ELYMUS VIRGINICUS	VIRGINIA WILD RYE	10.0	0.23	22%	15.4%
LEERSIA ORYZOIDES	RICE CUT GRASS	10.0	0.23	22%	15.4%
PANICUM CLANDESTINUM	DEERTONGUE	10.0	0.23	22%	15.4%
CHASMANTHIUM LATIFOLIUM	RIVER OATS	5.0	0.12	12%	7.6%
<b>GRASS TOTALS</b>		<b>45.0</b>	<b>1.04</b>	<b>100%</b>	
<b>GRAND TOTALS:</b>		<b>65.0</b>	<b>1.50</b>	<b>100%</b>	

PREPARATION OF THE SEEDBED (INCLUDING COIR LOGS AND STAKES) AND SOWING OF THE SEED MIXTURE SHALL BE AS SPECIFIED IN THE TDOT STANDARD SPECIFICATIONS MANUAL, SECTION 801. SEED SHALL BE APPLIED PRIOR TO WRAPPING WITH BIODEGRADABLE EROSION BLANKET (TYPE III).



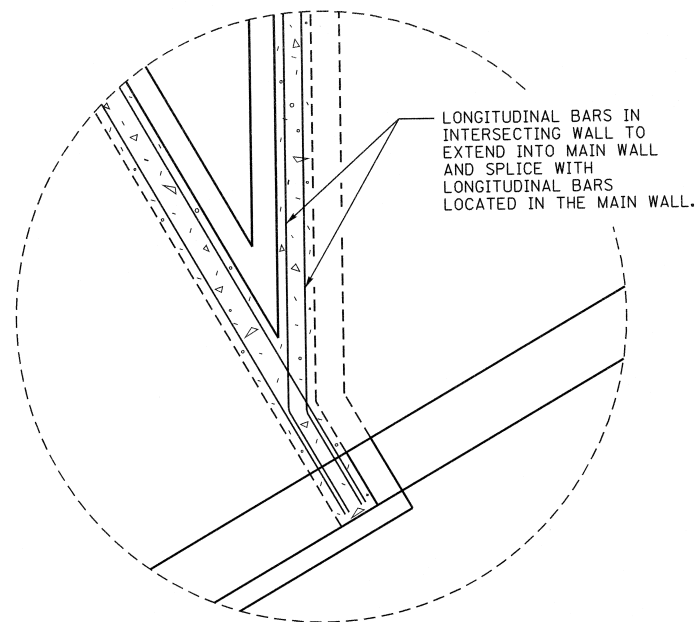
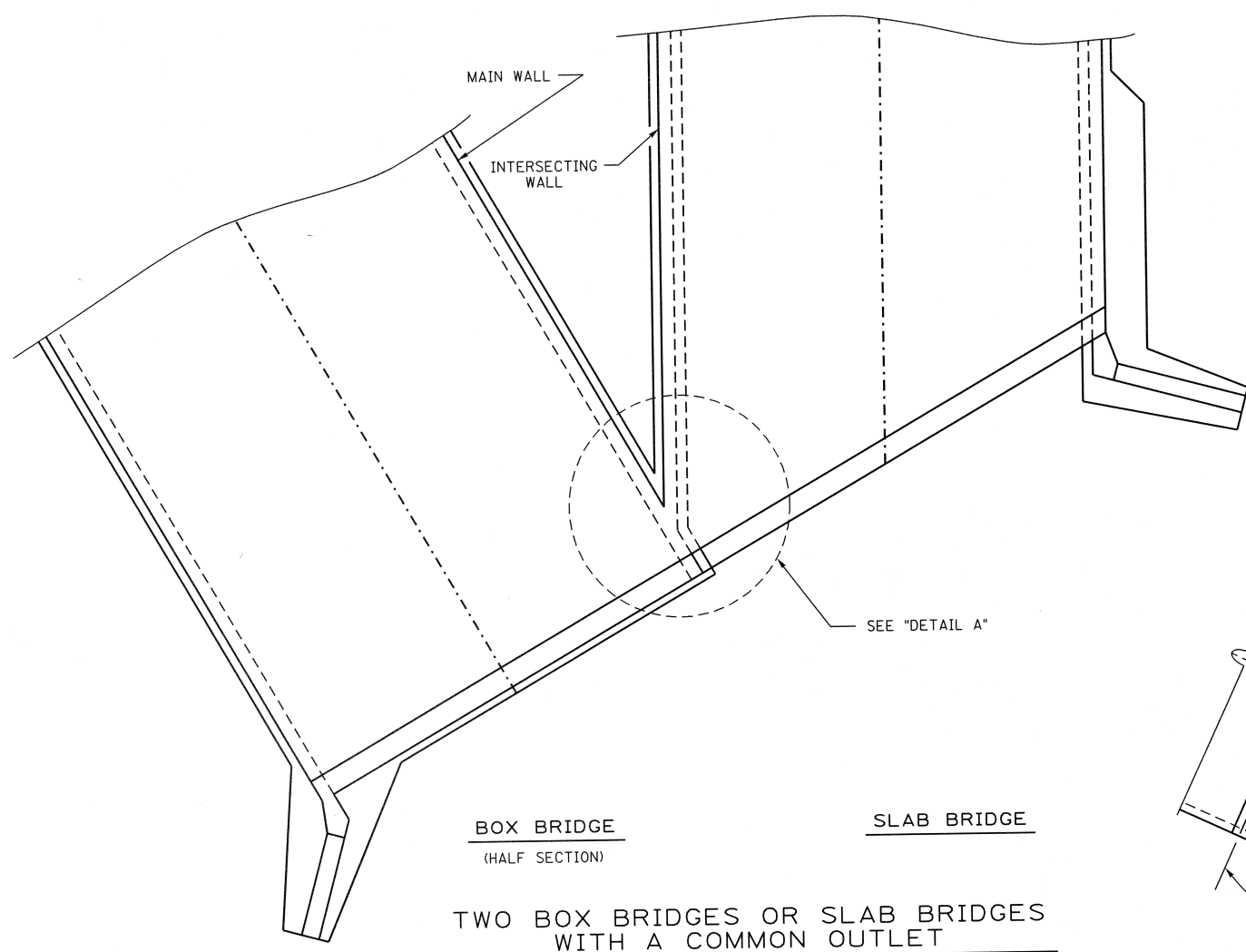
NOTE: DRAWING NOT TO BE USED WHEN CULVERT IS LESS THAN 6' IN HEIGHT.

STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION  
 LOW FLOW CHANNEL CONSTRUCTION  
 DETAILS FOR CULVERT INLET AND OUTLET

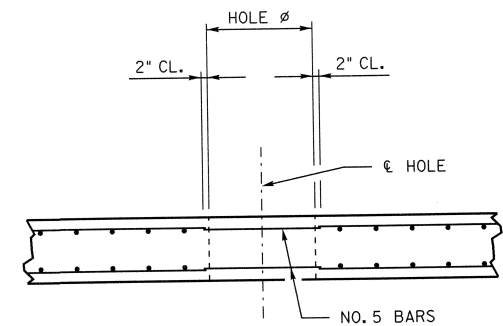
2010

CORRECT Edward P. Wasserman  
 ENGINEER OF STRUCTURES

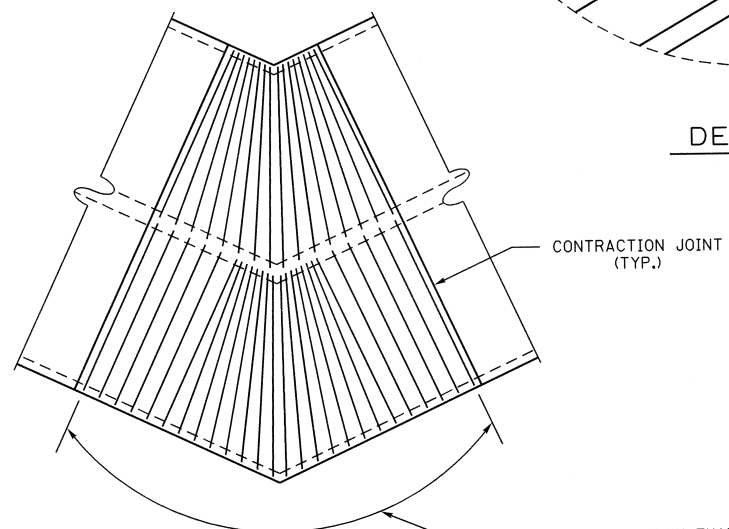
CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
	2010		
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



DETAIL A

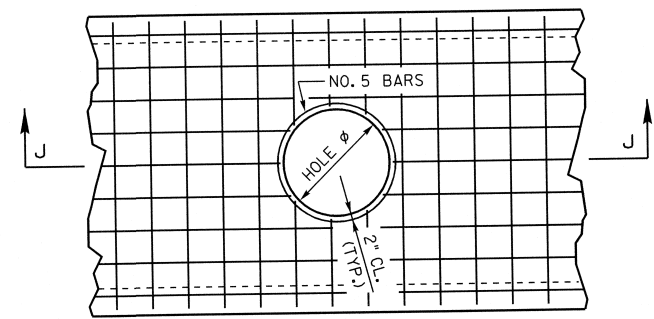


SECTION "J-J"



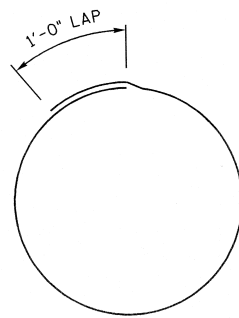
CHANGE IN DIRECTION DETAIL

(2 BARREL SHOWN; OTHER BARRELS ARE SIMILAR)

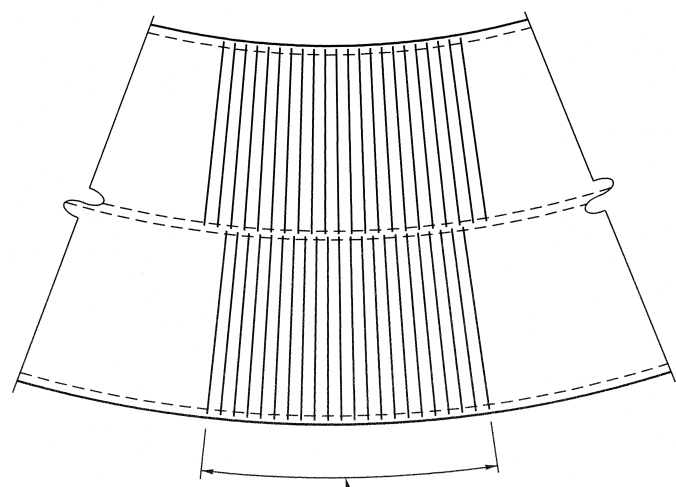


TYPICAL DETAIL FOR MANHOLES THROUGH TOP SLAB OR WALL

NOTE: THE HOLE FOR MANHOLES SHALL BE CAST IN THE SLAB OR WALL.



NO. 5 BARS (AROUND MANHOLE)

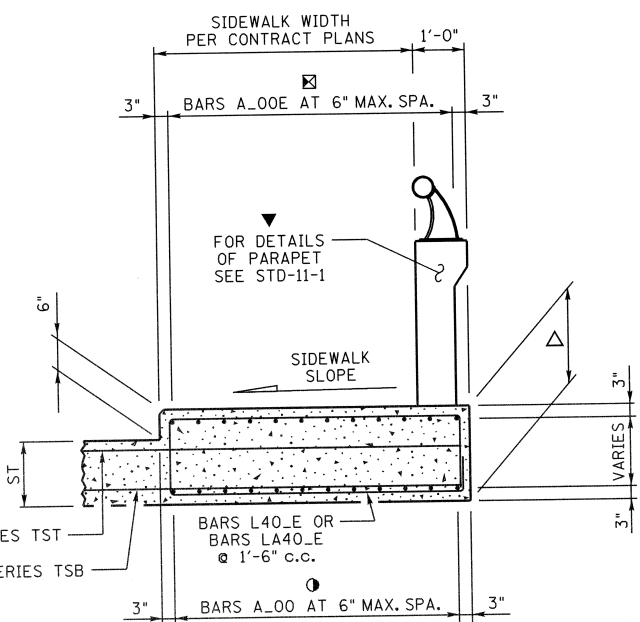


CURVED BOX DETAIL

(2 BARREL SHOWN; OTHER BARRELS ARE SIMILAR)

BOX BRIDGE (HALF SECTION)      SLAB BRIDGE

TWO BOX BRIDGES OR SLAB BRIDGES WITH A COMMON OUTLET



SIDEWALK DETAIL

(OUTLET END SIDEWALK SHOWN) (INLET END SIDEWALK SIMILAR)

- △ DENOTES DIM. OF SIDEWALK MAY VARY BASED ON THE THICKNESS OF THE SLAB (ST).
- ☒ DENOTES THE FOLLOWING BAR SIZES:  
BARS A800E (90° SKEW)  
BARS A800E (75° SKEW)  
BARS A900E (60° SKEW)  
BARS A1100E (45° SKEW)
- DENOTES THE FOLLOWING BAR SIZES:  
BARS A800 (90° SKEW)  
BARS A800 (75° SKEW)  
BARS A900 (60° SKEW)  
BARS A1100 (45° SKEW)
- ▼ NOTE: WHEN POURING ST, PROVISION SHALL BE MADE FOR SETTING REINFORCING STEEL FOR PARAPET. NO PORTION OF THE PARAPET SHALL BE POURED UNTIL THE ENTIRE ST AND SIDEWALKS ARE POURED AND CURED. ALL PARAPET REINFORCEMENT SHALL MAINTAIN 2" CL. TO INLET END CHAMFER.

NOTE: BARS LNT OR LND NOT SHOWN.

DESIGNED BY	CMH / MAH	DATE	12-09
DRAWN BY	DIANE BUSH	DATE	04-10
SUPERVISED BY	RLH / JWP / MAH	DATE	12-09
CHECKED BY		DATE	

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

SIDEWALK AND MISCELLANEOUS DETAILS

STANDARD REINFORCED CONCRETE BRIDGE BOX AND SLAB TYPE

2010

CORRECT *Edward P. Wasserman*  
ENGINEER OF STRUCTURES







